PERCEPTIONS OF SCHOOL MANAGEMENT TEAMS ON INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN TOWNSHIP AND RURAL SECONDARY SCHOOLS IN KWAZULU-NATAL

By

Michael Togara Tigere

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Supervisor: Prof Tshilidzi Netshitangani

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DECLARATION

I, **Michael Togara Tigere**, solemnly declare that this dissertation entitled: **Perceptions of school management teams on information and communication technology integration in township and rural secondary schools in KwaZulu-Natal** is my own work and it has never been presented in part or whole to any institution or Board for the award of any Degree. I further declare that all the information used and quoted has been duly acknowledged by means of complete reference.

Signature…… Date……

ABSTRACT

The purpose of the study was to investigate the perceptions of school management teams (principals and departmental heads) on information and communication technology (ICT) integration in the township and rural secondary schools. The study was set in KwaZulu-Natal Province, South Africa. Principals' perceptions were explored using the National Educational Technology Standards for Administrators (NETS-A) 2009 as the lens through which to view the study. The objective of the study was to investigate how school management teams' (SMT) perceived ICT integration in their schools. The four participating schools were selected from twelve that used computer laboratories for teaching and learning. The study was important as the setting, like the rest of the country, consists of two distinct sets of schools in terms of resources: one privileged while the other is underprivileged. Township and rural schools belong to the latter. The study was embedded in the interpretive paradigm and used the qualitative research method. It focused on four purposively selected township and rural secondary schools that integrated ICTs into teaching and learning. Three data collection tools were used: interviews, non-participant observation, and document analysis. Data were analysed using a qualitative approach.

The study found that the principals had persevered to implement ICT integration in their schools. Their instructional and technology leadership roles manifested themselves in several ways. They had been instrumental in organising technological tools such as tablets and computers through networking mainly with non-governmental organisations. They ensured that teachers attended the training workshops organised by the provincial department of education and encouraged them to incorporate technology in their lessons. The principals also ensured that technological equipment was always in working order to avoid disruption of teaching and learning. However, the study revealed that schools experienced serious challenges. Among the challenges were the shortage of computers in comparison to the schools' enrolment figures, which reduced the amount of time that learners could be accommodated in the computer laboratories, poor internet connection for online access, electrical power interruptions due to load shedding and blackouts, outdated school rules, and lack of training for teachers. The conclusion was that the principals and school management teams were able to fulfil their instructional and technological leadership roles and were positive about the implementation of ICT integration in their schools and wanted to see the effort going forward despite the challenges they experienced. The study recommended that school management teams broaden their understanding of ICT integration to improve leadership, source alternative means to finance ICT integration due to its high costs, and review school rules to accommodate gadgets such as cell phones for use in the classroom. It was hoped

that the findings would be useful to national and provincial authorities to understand the perceptions of SMTs on ICT integration and lead to effective and appropriate interventions.

KEY TERMS: school management team, principal, ICT integration, computer laboratory, teaching and learning

DEDICATION

This thesis is dedicated to my family for all the support, care, and motivation to complete the project.

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I owe it all to The Almighty for giving me the strength and the wisdom to start and complete this research project. I also wish to convey my gratitude to the following people for their contribution to this study:

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LIST OF ABBREVIATIONS AND ACRONYMS

4IR	Fourth Industrial Revolution
BYOD	Bring Your Own Device
CAT	Computer Applications Technology
DBE	Department of Basic Education
DoE	Department of Education
FET	Further Education and Training
GDE	Gauteng Department of Education
GET	General Education and Training
ICASA	Independent Communications Authority of South Africa
ICTs	Information and Communication Technologies
IT	Information Technology
KZNDoE	KwaZulu-Natal Department of Education
MoE	Ministry of Education
NETS-SA	National Educational Technology Standards for Administrators
NGO	Non-Governmental Organisation
NSC	National Senior Certificate
OECD	Office for Economic Cooperation and Development
PLC	Professional Learning Communities
SA-SAMS	South African School and Administration Management System
SGB	School Governing Body
SMT	School Management Team

TIMMS	Trends in Mathematical and Science Study
TPACK	Technological Pedagogical Content Knowledge
TPD	Teacher Professional Development
UNESCO	United Nations Scientific and Cultural Organisation
USAASA	Universal Service and Access Agency of South Africa

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CHAPTER 1

INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

The study focused on an important and contemporary topic, the use of information and communication technologies (ICTs) in teaching and learning. It concentrated on the perceptions of school management teams (SMTs) on ICT integration in teaching and learning in the township and rural secondary schools, with special reference to KwaZulu-Natal Province, South Africa.

The use of technology in the classroom has become prominent in today's schooling environment. Throughout the world, governments, education systems, researchers, school leaders and parents consider technology to be an essential part of a child's education (Eady & Lockyer, 2013). As a result, many South African schools have also taken steps to introduce ICTs as teaching support elements.

School management teams, including principals and departmental heads, in particular, are organisational leaders who are a key driving force in using ICTs in schools. As a result, they need to understand the capabilities of modern technology for them to make personal use of it and sustain a school's culture of exploring new methods for instruction, learning and management (Arokiasamya, Abdullahb & Ismailc, 2015). The study, therefore, seeks to investigate how school principals and departmental heads understand the use of ICTs during teaching and learning in their schools.

The aspects presented in this chapter were: background information to the study, theoretical framework, problem statement, rationale for the study, the research questions, aims of the study, significance of the study, the research methodology, ethical considerations, trustworthiness, the researcher's assumptions about the study, clarification of terms, an overview of the study and conclusion.

1.2 BACKGROUND OF THE STUDY

The advent of the twenty-first century has seen a high number of technological developments, which affect almost every aspect of people's lives (Mdlongwa, 2012). The main cause of this is the ever-growing use of ICTs in all facets of life, be it the workplace, sports field, and on a personal or social level. The education sector and schools, in particular, have not been spared the ICT revolution.

Schools use a variety of technological devices as learner support. The term e-learning is commonly used to describe any technology that can assist learning and includes radio, television, digital projectors, computers, tablets, smartboards, and so on (Bach, Haynes & Lewis-Smith,2007). Technology forms part of general education support services used as strategies for overcoming barriers to learning and for promoting academic success (Department of Education, 2001). Studies conducted in the United States of America have shown that the use of technology in schools can have benefits (Moeller & Reitzes, 2011). Firstly, it can help diagnose and address individual needs. Secondly, it equips learners with skills that are essential for the world of work and life in the 21stcentury. Thirdly, it can equip learners with skills to organise their learning process independently, so that, instead of being passive recipients of information, learners using technology become active users (Moeller & Reitzes, 2011).

In South Africa, the Department of Education (DoE) released a White Paper on e-education which outlined the government's response to the then new information and communication technology environment in education (DoE, 2004). Among the plans was to ensure that all schools have access to a wide choice of diverse, high-quality communication services for the benefit of all learners and local communities. This was meant to result in enhanced lifelong learning and the provision of unlimited opportunities for personal growth and development to all.

The Guidelines for Teacher Training and Professional Development in ICT (DoE, 2007) is the second policy document that created ICT in education policy. This policy document identifies ICT knowledge, skills, values and attitudes required by teachers to implement successfully the national curriculum. According to Vandeyar (2013), the country's focus on ICT in education as a springboard for economic growth and social development prompted provincial governments to initiate ICT projects in education.

Gauteng Province, through its education department, is one of the pioneers in South Africa to introduce ICTs in its schools. The province has committed to introducing smartboards and tablets for learners in all its schools (GDE, 2011, John, 2015). It is a complete departure from

the traditional chalkboard-exercise book approach to teaching and learning. This, in the view of the Gauteng Department of Education (GDE), is set to revolutionise the teaching and learning experience and result in better outcomes.

However, the introduction of ICTs into South African schools has not been without challenges. Among these is the lack of computer equipment in schools. Nkula and Krauss (2014) attest that some schools in South Africa are still without ICTs. The two researchers assert that those schools that do have access to ICTs only focus on learning about computers or acquiring ICT skills rather than integrating ICTs in the classroom. While some schools are at an advanced level in their use of ICTs in the classroom, a large number is still grappling with meeting basic needs. These are mostly infrastructural, such as inadequate classrooms, lack of proper ablution facilities, etc. These are historical legacies owing to the discriminatory practices of the previous political dispensation, which the incumbent authorities have committed to redressing.

In addition to the above, the presence of technology in schools has brought into focus the role of school management teams (SMTs) with regard to ICT integration in teaching and learning. The school principal as the head of the SMT is the most important and influential person in the school and is responsible for all activities that take place within the school (Fisher & Waller, 2013). According to Demski (2012), the principal is not only an instructional leader but also a technology leader. The principal's technological role involves integrating technology into the curriculum. Papaioannou and Charalmbous (2011) assert that while principals may be willing to implement technology at their schools, they require more focussed professional development to assist them move to effective technology implementation. Ugur and Koc (2019) suggest that as instructional leaders, principals who do not understand how to use technology cannot properly evaluate the use of it by teachers towards the improvement of learner attainment, one of the goals of ICT introduction in schools.

This study sought to explore how school management teams in the township and rural secondary schools in the KwaZulu-Natal province perceive information and communication technology integration. It is this researcher's view that technology, for example, tends to be associated with urban and historically advantaged school settings. Historically disadvantaged schools tend to be ignored as users of technology. This may be due to the high and prohibitive costs associated with technology.

Furthermore, the study needed to be conducted for three reasons. Firstly, it sought to shed light on how school management teams perceived integration of ICT in the township and rural secondary schools in achieving positive learning outcomes. Secondly, it wanted to provide a blueprint for school management-focussed training programmes, as the presence of

technology in classrooms required suitably trained leaders. Thirdly, both school and education authorities needed to have an informed view of what was happening at the school level to take appropriate decisions.

1.3 RATIONALE FOR THE STUDY

This study attempted to explore how school management teams in the township and rural secondary schools in the KwaZulu-Natal province perceive information and communication technology integration. It was the researcher's view that technology, for example, tended to be associated with urban and historically advantaged school settings. Historically disadvantaged schools tended to be ignored as users of technology. This may have been due to the high and prohibitive costs associated with technology.

The study needed to be conducted for three reasons. Firstly, to shed light on how school management teams perceive the integration of ICT in the township and rural secondary schools in achieving positive learning outcomes. Secondly, to provide a blueprint for focused school management training as the presence of technology in classrooms requires suitably trained teachers. Thirdly, both school and education authorities needed to have an informed view of what is happening at the school level to take progressive decisions.

1.4 THEORETICAL FRAMEWORK

The theoretical framework underpinning the study was the National Educational Technology Standards – Administrator (NETS-A) 2009. The International Society for Technology in Education (ISTE) writes standards and guidelines for principals, teachers and learners in technology. The organisation is committed to promoting the educational curriculum of technology to improve learning and support teaching with technology (ISTE, 2009). These standards provide a framework for guiding digital age learning. Principals are informed, though NETS-A guidelines, what constitutes effective school leadership for comprehensive and effective use of technology in schools (ISTE, 2009). The NETS-A framework is premised on educational systems' attempts to keep abreast of the impact computers are making in society.

The following are the NETS-A standards for schools principals:

1.4.1. Visionary Leadership

Visionary leadership was the first level the school management team needed to reach as a technological leader. The school management team had to have a vision of integrating technology into teaching and learning and share this vision with the teachers. This, therefore,

meant the school management team needed to have a steady and strategic technology plan to support the vision of technology that had been created (ISTE, 2009).

1.4.2 Digital Age Learning Culture

The second standard called for the school management team to create a digital learning culture throughout the school. The school management team should encourage effective learning through enough technological equipment and resources (ISTE, 2009).

1.4.3 Excellence in Professional Practice

The school management team should nurture an environment of professional learning and innovation that gives teachers the power to promote learning through technological and digital resources. In the process, the school management team became a role model for promoting the use of technology in the digital era (ISTE, 2009).

1.4.4 Systemic Improvement

This standard implored the school management team to work with the teachers to collect data, analyse data, interpret the findings and share the findings to improve teacher performance and student learning. The school management team provided digital age leadership and management to improve the school through the effective use of information and technology resources. The maintenance of infrastructure was the responsibility of the school management team (ISTE, 2009).

1.4.5 Digital Citizenship

In this fifth and final standard for technology leadership, the school management team had to ensure that the school community had equal access to digital resources. Furthermore, the school management team needed to promote, model and establish policies for the use of technology that are safe, ethical and legally compliant (ISTE, 2009).

The above standards were discussed in detail in Chapter 2.

Adherence by school management teams to these standards would assist in ensuring that schools produce learners who were equipped with twenty-first-century competencies that would be required for the jobs of the future.

However, leadership theories, namely, distributed leadership and transformative leadership form part of the school management teams' technology leadership and are still relevant today.

The researcher chose NETS-A based on the belief that modern-day school management teams required high-level skills in the management of technology used for schools to achieve desired outcomes. Secondly, today's young people are perceived to be more in tune with technology than their predecessors. Technology provided an opportunity for young people to learn using tools that they understood better. So, the importance of a technology well-versed school management team became crucial. The theoretical framework that underpinned this study was broadly discussed in Chapter 2.

1.5 PROBLEM STATEMENT

The global shift towards learning with information and communication technologies in recent years is seen as a move towards equipping learners with 21st-century skills. These skills largely fall under three categories: learning and innovation (e.g. creativity, critical thinking, collaboration); information, media, and technology (e.g. digital literacies); and life and career skills (Ball, Joyce & Anderson-Butcher, 2016). Therefore, some of the goals of the South African government are directed at producing learners armed with these skills (DBE, 2004). Technology is also aimed at encouraging learners not to be passive recipients but active creators of knowledge (Mukhari, 2016). To achieve these goals, schools across provinces, including KwaZulu-Natal, have ICT to aid teaching and learning.

The introduction of ICTs in school has presented numerous challenges. Firstly, it has added a new dimension to school leadership. Technology leadership has become a requirement for principals. However, Mingaine (2013) asserts that the principal's interest, commitment and championing of ICT programmes has a positive impact on their success. Thannimalai and Raman (2018) further add that the Fourth Industrial Revolution (4IR) demands that principals adopt an open mind to navigate the changes and advances brought by fast developments in technology. Secondly, teachers are expected to possess technological skills to implement the new teaching goals. Thirdly, learners need to have a certain level of proficiency in the use of ICTs to be able to explore the vast internet landscape. The three factors are compounded by the shortage of adequate computer equipment in schools (Nkula & Krauss, 2014). These pose major challenges for school management teams in their attempts to integrate ICTs in teaching and learning.

While the introduction of ICTs into schools is ongoing, there are internal challenges that continue to be encountered within schools. One of them concerns the differences in attitudes among staff, which are a result of the age differences. Some of the older teachers refuse to use technology, as they still believe in the traditional methods of teaching, while the younger teachers are at ease when it comes to technology use. This causes a dilemma for school management teams that want to implement and sustain ICT integration within their schools.

On the other hand, as stated earlier, learners happily embrace technology and are willing to learn through it. School management teams need the requisite skills to deal with such challenges.

The lack of funds within government departments is cited as the cause of the slow pace of ICT introduction within KwaZulu-Natal schools. Some township and rural schools have started receiving ICT equipment and are using it in classrooms. Given the above-mentioned reasons, the researcher investigated school management teams' perceptions of ICT integration in the township and rural secondary schools in KwaZulu-Natal province.

1.6 RESEARCH QUESTION AND SUB-QUESTIONS

The main research question guiding this study were as follows:

How do school management teams perceive the integration of information and communication technologies in the township and rural secondary schools in KwaZulu-Natal?

From this main research question, the following sub-questions were derived:

- How do principals perceive the integration of information and communication technologies at the school?
- How do departmental heads perceive the integration of information and communication technologies at the school?
- How can the integration of information and communication technologies at the school be improved?

1.7 AIM AND OBJECTIVE OF THE STUDY

The study aimed to enquire how school management teams perceived the integration of information and communication technologies in the township and rural secondary schools in KwaZulu-Natal.

The objectives of the study were as follows:

- Enquire how principals perceived the integration of information and communication technologies at the school.
- Explore how departmental heads perceived the integration of information and communication technologies at the school.

- Determine what could be done, based on the literature review and the findings of the empirical study, to improve the integration of information and communication technologies at schools.

1.8 SIGNIFICANCE OF THE STUDY

The significance of the study was that it sought to investigate school management teams' perceptions of information and communication technology integration in their schools. It sought to understand school principals' and departmental heads' understanding of the challenges and successes as experienced in the practice of ICT integration in teaching and learning.

The significance of the study was analysing the research findings and arriving at conclusions and recommendations to ensure their acceptance. The findings were, hopefully, to be useful to the education authorities in understanding the perceptions of school management teams with regard to ICT integration and, therefore, effect suitable interventions.

1.9 RESEARCH METHODOLOGY AND DESIGN

1.9.1 Research paradigm

The study was located in the interpretive paradigm as it sought to understand how school management teams perceive the management of information and communication technology in KwaZulu-Natal township and rural secondary schools. According to Cresswell (2014), in this paradigm, the researcher wants to confirm the meaning of a phenomenon from the views of the participants. One of the crucial components of collecting data in this way is to observe the behaviour of participants during their involvement in activities (Cresswell, 2014). Walliman (2016) posits that the interpretive paradigm ties the researcher into the human situation he/she is studying. Therefore, the researcher cannot be observing phenomena from outside the system. Kuada (2012) states that the interpretive paradigm emphasises the need to understand how people define situations in which they are involved and the meanings they derive from their experiences. Furthermore, Kuada (2012) emphasises that this paradigm requires the researchers to see their actors as engaged in continuous interpretation, creation of meaning and making sense of events and their settings.

1.9.2 Research approach

In this study, the researcher was interested in the qualitative experiences of SMTs. Qualitative methods were exclusively used. The nature of the topic could best be served by these methods. Qualitative research methods are utilised to answer questions about experience,

meaning and perspective, usually from the viewpoint of the participants (Hammarberg, Kirkman & De Lacy, 2015). Qualitative research techniques include “small-group discussions” for investigating beliefs, “semi-structured interviews” to search for views on focused topics with key informants and analysis of texts and documents (Hammarberg,*et al.,* 2015).

According to Hashemnezhad (2015) qualitative methods are more adaptable as they allow greater spontaneity and adaptation of the interaction between the researcher and the study participant. Furthermore, qualitative methods are mostly open-ended questions that are not necessarily worded in exactly the same way with each participant. This provides participants the freedom to respond in their own words and more detail. The researcher has the opportunity to respond quickly to what the participant says and to tailor his/her questions accordingly (Hashemnezhad, 2015).

1.9.3 Population and sampling

In identifying the research population, the researcher applied purposive sampling. According to Rule and John (2011), purposive sampling is where people selected as research participants are intentionally chosen because of their suitability to advance the purpose of the study. People are selected because of their suitable knowledge, interest and experience in relation to the case. The researcher, therefore, requested a list of schools with ICTs from the KwaZulu-Natal Department of Education. From the list of 65 schools, 22 were identified as meeting the criterion. Upon further inquiry, it emerged that only12 of the schools actively used the computer laboratories for teaching and learning. Out of the twelve schools, four were selected as participants. The four schools were located within the township and rural areas of the EThekwini Municipality, KwaZulu-Natal. At each school, the principal, and a departmental head were interviewed. The principal is responsible for the professional management of the school and better placed to provide an overall view of the existing situation. The departmental head is part of the school management team and is largely responsible for curriculum management within the school. The departmental head assisted in providing a broader picture of management’s perceptions.

1.9.4 Instrumentation and data collection techniques

Three data collection techniques were used, namely, semi-structured interviews with a purposely selected sample of school principals and departmental heads; non-participant observation and document analysis.

In-depth interviews investigated individual experiences, beliefs and behaviour related to the phenomenon under investigation. According to Kuada (2012), the qualitative interview wants

to gain an insight into the lived experiences of the people one is interviewing. Furthermore, it gives the researcher the opportunity to listen to what the subjects themselves say about issues that are being investigated in their own words. A popular qualitative interviewing technique that was useful in this study was the *critical incident technique.* It allowed the people being interviewed to freely describe their experiences, and to unreservedly express their feelings, and to reflect on their experiences while they were talking to the researcher (Kuada, 2012). In this way, the researcher and the participants were able to explore new dimensions in the investigation.

The advantages of using interviews were that they generated a large amount of data. They allowed the researcher to enter the world of the participants in the process of trying to gain an understanding of their experiences (Robson, 2011) and the researcher was also able to probe for clarity and depth during the interview.

The interviews with the principals and departmental heads were conducted on a one-on-one basis using the same set of questions. It meant that each participant was interviewed on his own to allow free expression. Interviews were conducted after school hours to avoid disrupting the teaching and learning programme. An audio recording equipment in the form of a voice recorder was utilised to capture the interviews. Each interview was approximately 30 minutes long, as the researcher believes this would give sufficient time for each participant to express him/herself adequately.

The second data-collecting tool used was non-participant observation. This is a research technique whereby the researcher watches the participants of his/her study, with their knowledge, but without taking an active part in the subject under scrutiny (Nieuwenhuis, 2007). For this study, non-participative observation was performed before, during and after the interviews had been conducted. The focus of the observation was on the physical characteristics of the computer laboratories, how ICTs were used and the conduct of the participants during lessons. Non-participant observation helped supplement the information obtained from the participants with regard to the use of ICT in schools.

The third data collecting tool was document review. The researcher used official documents such as White Papers, government reports and policy documents to seek a wider understanding of ICT in education. Newspaper articles and the internet were also consulted to obtain a broader view of the research problem.

1.9.5 Data analysis and interpretation

Babbie (2017) describes qualitative data analysis as an approach to making sense of social observations without changing data to a numerical format. Therefore, the researcher commenced by listening to the recorded interviews several times. In the process of listening to the interviews, patterns and themes began to emerge which facilitated coding of the data. Coding is a form of analysis that involves how the researcher differentiates and combines the data retrieved from participants and reflections he/she has made about such information (Babbie, 2017).

During the process of analysis, the researcher used inductive analysis in the empirical study as well as deductive data analysis. These helped the researcher to triangulate the findings by using the categories and themes that emerged through inductive analysis to test, compare and clarify the findings (Mukhari, 2016).

1.10 ETHICAL CONSIDERATIONS

In this study, the researcher complied with the generally-practiced principles of social research. Before commencing the study, permission was sought from the KwaZulu-Natal Department of Education as all the selected schools fall under its jurisdiction. The researcher applied for ethical clearance from UNISA's Ethics Committee prior to gathering data at the selected schools. Upon approval, ethical standards were maintained by observing all protocols as prescribed by the ethics committee. Recognition of the need for confidentiality, informed consent and disclosure of the nature, purpose, and requirements of the research study were maintained. The researcher conducted interviews with principals and departmental heads mainly after hours to avoid disturbing the smooth functioning of the schools. The participants were given consent forms through which they agreed to be interviewed. These consent forms were collected before the interview sessions. The researcher guaranteed anonymity and confidentiality to the participants.

1.11 TRUSTWORTHINESS

In this study trustworthiness targeted through ensuring credibility, transferability, dependability and confirmability. Therefore, the researcher conducted preliminary visits to the selected schools. The visits were necessary to establish familiarity and trust with the participants and to give clarity to any matter that might have arisen. Member-checking, where the participants were given the opportunity to view the transcripts of the interviews was undertaken. To prevent researcher bias, triangulation of interview data, observation, and document review took place.

1.12 THE RESEARCHER'S ASSUMPTIONS ABOUT THE STUDY

The schools were selected based on the researcher's assumptions listed below:

- The schools had sufficient ICT equipment for teaching and learning.
- The principals were instructional and technological leaders in their schools.
- The principals and departmental heads cooperated in the management of the curriculum.
- ICT policies existed at the schools.
- Teachers and learners were computer literate.
- ICT integration in teaching and learning took place.

1.13 LIMITATIONS AND DELIMITATIONS OF THE STUDY

The small research sample meant that the results could not be generalised. Other limitations were the subjective bias of the researcher and the theoretical objectives selected. Furthermore, the researcher's interest in the topic might have influenced the interpretation of the findings of the study. Lastly, the limited time available to complete the study might have influenced the depth to which the subject could be probed.

The study was limited to four public township and rural secondary schools in the eThekwini Municipality, KwaZulu-Natal Province. The study was conducted in four secondary schools falling under the KwaZulu-Natal Department of Education, Pinetown District. The researcher interviewed four school principals and departmental heads, respectively.

1.14 DEFINITION OF KEY CONCEPTS

- School management team (SMT): In South African schools, the SMT holds formal positions of leadership within the school's organisational structure. It consists of the school principal and/deputy and departmental heads (Ntuzela, 2008).
- Integration: The process of determining where and how technology fits in the teaching and learning environment (Ghevifekr & Rosdy, 2015).
- ICTs for schools: Technology (machines, devices, equipment and systems) that can be used by schools as media for information and communication purposes (GDE 2011).

e-Learning/ e-Education: The two terms refer to the use of ICT's in the teaching and learning environment (Gauteng Department of Education, 2011)

1.15 CONCLUSION

In this chapter, an introduction, background and overview of the proposed study were presented. The rationale of the study was outlined which was followed by a statement of the problem. The research question was then stated which led to the aims and objectives of the study. This was followed by research methodology and design. Ethical considerations were outlined followed by limitations and delimitations of the study. Key concepts were then defined. The next chapter discussed the theoretical framework for the use of ICTs in teaching and learning.

CHAPTER 2

THEORETICAL FRAMEWORK FOR THE USE OF ICTs IN TEACHING AND LEARNING

2.1 INTRODUCTION

The previous chapter provided an outline of what the researcher intends to explore with regard to school management teams' perceptions of ICT integration in teaching and learning in the township and rural secondary schools in KwaZulu-Natal. This chapter will begin by examining teaching and learning in the 21st century. This will be followed by a discussion on leadership in the use of technology in schools. Learning theories about the use of ICTs in teaching and learning will then be discussed. The chapter will then shift its attention to the National Educational Technology Standards for Administrators (NETS-A) 2009, which provides a wide conceptual framework for describing the qualities required of technology leaders. The chapter will continue with a discussion on how ICTs can be utilised in the education milieu where different learning theories are used for effective teaching and learning to take place. It will conclude with a discussion on the barriers to the use of ICTs in schools.

2.2 OVERVIEW OF TEACHING AND LEARNING IN THE 21st CENTURY

> "A generation ago, teachers could expect that what they taught would last their students a lifetime. Today, because of rapid economic and social change, schools have to prepare students for jobs that have not yet been created, technologies that have not yet been invented and problems that we don't yet know will arise" (OECD 2017: 23).

This comment was made by the Office for Economic Cooperation and Development (OECD) official Andreas Schleicher in response to the rapid technological changes that are taking place in the world today.

The 21st century has brought a shift in thinking in terms of how education is provided in schools. This has been brought about by the perceived needs of commerce and industry as the creator of wealth and jobs. According to Kereluik, Mishra, Fahnoe and Terry (2013), an increasingly globalised economy requires a completely different model of education compared to the 20th century one where emphasis was placed on repetition, basic applied knowledge and limited literacy. In addition to globalisation, Kereluik *et al.* (2013) add technological

modernisation as another phenomenon that has justified a rethink in the kinds of knowledge required for the 21st century. Technological modernisation incorporates the shift in developed countries from manual and routine jobs into a knowledge economy and the spread of technology from mainly the place of work into all aspects of personal and professional life. Hallissy, Butler, Hurley & Marshall (2012) attest that today's world of work is an ever-evolving environment where employers expect their employees to have a wide array of skills and competencies to survive a globally competitive environment. The skills include being knowledgeable about the world, thinking outside the box, being smarter about accessing information, possessing good people skills, and the ability to solve problems, to work as a team, and to become a lifelong learner. Ledward and Hirata (2011) aver that success in today's world demands the ability to access, synthesise, and communicate information. Furthermore, the ability to work in collaboration with others across language and cultural barriers to solve diverse problems, while creating new knowledge through the innovative use of technology, is considered a necessity.

Wagner (2010) offers another set of skills and competencies crucial to surviving in the 21st century. These are: critical thinking and problem solving; collaboration and leadership; agility and adaptability; initiative and entrepreneurialism; effective oral and written communication; accessing and analysing information; and curiosity and imagination. While ICTs are not mentioned in these expected skills and competencies, Trainor (2014) suggests that they are the means to achieve the end-goals, the tools available to enhance teaching and learning.
Since schools are supposed to be the catalyst that prepares learners for the world of work, it follows that they should offer a kind of education that offers these competencies and skills to learners to prepare them for it. Schools, therefore, need to have teachers with the ability to impart the requisite skills to the learners.

It has to be considered that the level of technology use in schools varies from country to country. For example, in the United States of America (USA) every school has internet access and nearly one computer for every four learners (Snyder, Dillow & Hoffman, 2009). In comparison, South Africa came up with a white paper on technology integration in 2004 and still has schools without computers for teaching and learning (Nkula & Krauss, 2014). This factor inevitably points to disparity in terms of technology available within schools between these two countries. While the two countries are not in competition, this disparity serves to highlight the distance South African schools still have to cover to be at the level of counterparts in developed countries.

Considering that teachers are at the forefront of technology integration in schools, several initiatives have been implemented in various countries to encourage the adoption of

technology (Bakir, 2016). Governments and educational organisations have advocated for the use of technology in schools, primarily through the training and education of teachers in the use of technology. In the USA the Department of Education adopted a national plan to determine how technology was being taught in that country's schools. The plan made a special case for the improvement of teacher training at the tertiary level. Four educational goals were introduced:

- All teachers in the country will be given training and support they need to help learners learn using computers and the information superhighway.
- All teachers and students will have modern multimedia computers in their classrooms.
- Every classroom will be connected to the internet.
- Effective software and online learning resources will be an integral part of every school's curriculum (U.S. Department of Education, 1996).

In the past decades, education focused on teaching learners the "3Rs", which were reading, writing and arithmetic. In this traditional approach, a teacher taught the content through repetition, making learners say or write the same thing over and over again (Alismail & McGuire, 2015). Oluwatumbi (2015) compares the traditional teacher to a dictator who had to pour knowledge into passive learners like they were empty vessels ready to be filled. The modern teacher is a facilitator of the teaching and learning process.

However, the introduction of technology into education has disrupted the traditional way of teaching. Pavlik (2015) opines that, in broader terms, technology has had four main influences on education. Firstly, it has transformed teaching and learning methods. Secondly, it has reshaped the content of what is taught and learned. Thirdly, it has transformed educational institutions, structures and costs of keeping them operational. Fourthly, technology has redefined the relationships between and among learners, teachers and educational institutions

The chart below illustrates the characteristics that represent traditional approaches to teaching and learning in contrast to corresponding strategies that are aligned to modern 21st-century learning environments.

Table 2.1

Differences between traditional and 21st century approaches to teaching and learning.

Traditional Learning Environments	New Learning Environments
Teacher-centred instruction	Student-centred learning
Single-sense stimulation	Multisensory stimulation
Single-path progression	Multipath progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive learning	Active/ exploratory/ inquiry-based learning
Factual, knowledge-based learning	Critical thinking and informed decision making
Reactive response	Proactive/ planned action
Isolated, artificial context	Authentic, real-world context

(ISTE, 2014)

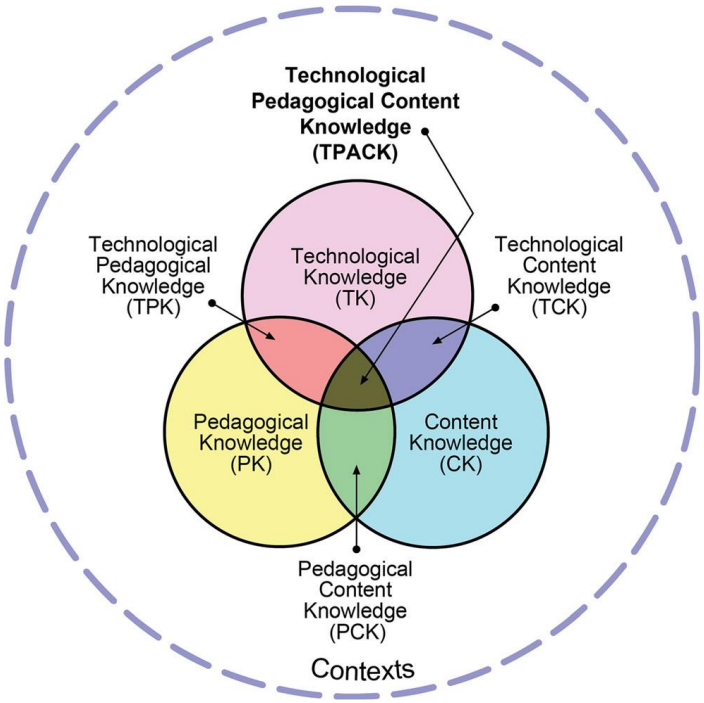
Table 2.1 clearly shows the shift that has taken place in the approach to teaching and learning. It also points out to the need to review approaches to teacher training in order to align their skills with the demands of the modern era. In response, teacher development strategies have been brought to the fore of educational innovations in recent years, more especially with regard to new technologies (Davis, Preston & Sahin, 2009). The focus of these innovations has been capacity building among teachers for both classroom practice and on a systemic developmental level (Davis, *et al.,* 2009).

In view of the need for a standardised approach towards technology integration in the training of educators, researchers began to develop theoretical frameworks on the subject. Among the theoretical frameworks that emerged was the Technological Pedagogical Content Knowledge (TPACK), which is widely regarded as a model for the knowledge educators need to successfully integrate education technology into their teaching practice (Sang, Tondeur, Chai & Dong 2014, McClanahan,2017).

Below is a graphic illustration of the TPACK model

Figure 2.1

TPACK model



The three main components in the TPACK framework are content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). The other components, PCK, technological content knowledge (TCK), and technological pedagogical knowledge (TPK), and TPACK, are knowledge developed through the interactions between and among these bodies of knowledge

(Mishra & Koehler, 2006)

But efforts to prepare teachers to meet the demands of technological advancement and 21st-century skill requirements are not without challenges. These challenges have a material effect on technological integration. According to Brenner and Brill (2016), teachers mention a lot of content to teach, not enough time to create and implement technology-based lessons, and lack of software available in the school as barriers. Nkula and Krauss (2014) assert that many schools in countries like South Africa still do not have access to computer and information technologies. Furthermore, many of the schools that do have access to ICTs tend to utilise it in a limited manner and only focus on learning about computers or obtaining ICT skills. This

results in a situation where ICTs are implemented without integration as opposed to implementation with integration, where learners use ICTs to learn and where ICTs are part of teaching and learning practices.

2.3 LEADERSHIP IN THE USE OF ICTs IN SCHOOLS

The role of technology leadership in schools is the responsibility of the school's management team (SMT). The principal, as leader of the SMT, commands all the school improvement changes, including those that are technological in form. He/She, therefore, performs this duty, in his/her capacity as a technological leader (Mwawasi, 2014).

Schools need to develop a vision for the use of ICT. This role is the responsibility of the principal. To have a clear vision means understanding what the institution wants to achieve (Chang, 2012). In a school this means the formulation of a shared vision to maximise the success of ICT use. A shared vision guides and develops the school's strategic plan, which provides the members of the school community a common direction hence enabling people to work together. Among the questions, the vision addresses are how ICT resources and facilities are used, how they are integrated into teaching and learning, how they are maintained, the technical support required to keep them in working order; plans for upgrading and further development; and further capacity building and professional development for staff in the use of computers and other ICT (Chang, 2012).

In addition, Machado and Chung (2015) assert that principals need to create a vision for effective technology integration and then provide teachers with ongoing supportive professional development integration goals. Furthermore, principals need to be equipped with skills and capabilities for dealing with administrative tasks that can enable schools to meet the demands set by the education department, and stakeholders such as parents (Nomnian & Arphattananon,2018).

The importance of the principal as an instructional and technological leader cannot be discounted. Researchers Yieng and Daud (2017) conducted a study of principals of Malaysian high-performance schools. These schools excel in all educational aspects. Some of the findings were: apart from being instructional and technological leaders, principals at these schools were also strategic and community leaders. The principals were always sensitive to the changes taking place in technology and were always willing to improve their technological skills. They allocated time, effort and energy to put in place the necessary technological innovations as required by the school.

But, in another study conducted by Machado and Chung (2015), when asked what they perceived to be their role in influencing integration at their school, the principals felt that it was not entirely their role, but that of the teachers as well. The principals perceived that the willingness of the teacher, coupled with professional development and support from the district office, were key to integration. This is in line with a finding of an earlier study by Ottenbreit-Leftwich, Glazewski, Newby and Ertner (2010) that a teacher's beliefs about the effectiveness of and difficulty when integrating technology had an influence whether or not he/she used technology in class.

The above examples highlight the expanded and varied roles that principals have to play at their schools. However, the everyday reality is that, apart from the skills set possessed by principals of high-performance schools mentioned earlier, not many principals would possess such a wide variety of skills. In some schools, the principal may not possess sufficient technological skills to lead integration. This would lead to another member of the school management team, such as a departmental head, being delegated to lead the integration drive. This leads to a discussion on two forms of leadership styles principals can use to involve other managers at the school. These are distributed leadership and transformational leadership.

2.3.1 DISTRIBUTED LEADERSHIP

Distributed leadership is where responsibility for managing the various tasks in an organisation is distributed among individuals being given different roles (Goskoy, 2015). According to Harris, Jones and Baba (2013), in this form of leadership, tasks are fulfilled through interaction and collective action within the group. It is based on the belief that a complex organisation cannot be efficiently managed by an individual. This form of leadership is preferable since schools can be viewed as complex organisations. While it is a departure from the traditional top-down leadership approach, it does not take away the overall leadership and accountability functions of the principal. What it mainly does is reduce the principal's daily load of activities, while empowering other members of staff who may/ may not belong to the SMT.

Distributed leadership requires a collaboration of different skills that lead the team to succeed. Each individual brings a particular skill for the overall good of the team effort. In a study conducted by Hauge and Norenes (2015) on how school leaders perceived leadership in the development of ICT, schools that practised distributed leadership worked as a team and distributed activities. This depended on the educational and technological expertise of the members at all levels.

2.3.2 TRANSFORMATIONAL LEADERSHIP

Kouni, Koutsoukos and Panta (2018) describe transformational leaders as possessing an appealing and charismatic personality. This is merged with a powerful influence and a broad vision. Transformational leaders should be able to spark enthusiasm among teachers and inspire them to reach maximum use of their skills and capabilities. In addition to these characteristics, Seyal (2015) asserts that transformational leaders were expected to define the needs to change. They had to create new visions while encouraging commitment to those visions. This would change the organisational culture while inspiring the staff to take a bigger responsibility for their development and that of others.

ICT integration would benefit from a transformational principal. Schools exist in a rapidly changing environment. The pace of technological development requires principals who are quick to adapt while fostering a spirit of change and development among teachers and learners. Resistance towards the adoption of ICTs in some schools is common. Failure to curb it may result in lost opportunities that might risk the school being left behind. A transformational principal inspires, encourages and sustains ICT integration to achieve the school's vision. Attention will now turn to learning theories.

2.4 LEARNING THEORIES

The use of information and communication technology (ICT) in teaching and learning has a major impact on principals, teachers, learners and the community. While the main focus of the study concerns school management, the researcher deems it crucial to briefly touch on the subject of learning since one of the tasks of school leadership is to manage the teaching and learning aspect. Managers need to understand how learning takes place to be in a position to select and employ the appropriate ICTs. Ertmer and Newby (2013) advance three reasons why it is crucial to understand learning theories. Firstly, knowledge of theory allows the educational practitioner to translate relevant aspects of it into practical teaching solutions. Understanding how the mind retains information would allow the teacher to design lessons towards promoting retention, for example. The teacher would be better placed to decide on the best technological tool to use. Secondly, theories are a fountain of proven instructional methods, tactics and techniques. Thirdly, theories provide the grounds for informed selection of the correct strategies when teaching.

It stands to reason that school management needs to understand the position of the teacher in the classroom and what it entails. This would include understanding the situational constraints the teacher might be confronted with. Education is results-driven, therefore, early

detection of challenges is key. A principal who does not understand fully the teaching and learning process cannot offer long-lasting solutions that would ultimately benefit both teachers and learners.

What is learning? Learning is a knowledge-building activity that is basic to all humans from birth onwards (Young, 2015). It is social in that, directly and indirectly, it involves others, for example, teachers, families, and local communities. It is, therefore, not enough for school managers and teachers to have only the knowledge of their subjects. School managers and teachers also need to have a strong command of learning theories and their application in order to improve teaching practices in the classroom. According to Yilmaz (2011), teachers should have both subject-matter knowledge and pedagogical content knowledge and skills to accomplish the subjects' goals. Furthermore, teachers need to understand both the philosophical assumptions and theoretical perspectives that delineate a given instructional framework.

Learning theories can be classified into three main areas, namely, behaviourism, cognitivism, and constructivism (Yilmaz, 2011).

2.4.1 Behaviourism

Behaviourism is one of the earlier theories of learning. John Watson (1878-1958) and Skinner (1904-1990) are the two originators of behaviourist approaches to learning (Zhou & Brown 2015). Behaviourism is chiefly concerned with aspects of human behaviour that can be observed and measured. In defining behaviour, behaviourist learning theorists emphasise changes in behaviour that result from stimulus-response associations made by the individual. Behaviour is directed by stimuli. An individual chooses one response instead of another because of prior conditioning and psychological drives existing at the moment of action (Ertmer & Newby, 2013).

According to behaviourist theorists, the only behaviours that can be studied are those that can be directly observed. As a result, it is actions, rather than thoughts or emotions, which are justifiable objects of study. This theory does not explain abnormal behaviour in terms of the brain or its inner workings, it rather suggests that all behaviour is a result of habits that people learn and attempts to explain how these habits are formed (Zhou & Brown, 2015).

Behaviourists also assume that since human behaviour is learned, it can also be unlearned and replaced by an acceptable one. The rewarded response is the fundamental element to this theory of learning. For learning to take place, the desired response must be rewarded (Ertmer and Newby, 2013). This learning theory characterises a learner as only being reactive

to conditions that exist in the environment as opposed to one taking an active role in the discovery of the environment.

2.4.1.1 Behaviourism in learning and ICT integration

Behaviourist techniques have been used for a long time in education to promote acceptable behaviour and discourage that which is not. Among the methods emanating from behaviourist theory for practical classroom application are contracts, consequences, reinforcement, extinction and behaviour modification (Zhou & Brown, 2015).

The technological advances and the needs of the 21st-century learner have prompted some researchers to explore how behaviourist theory can be adapted to these challenges. Pitler, Hubbell, Kuhn and Malenoski (2007) offer an example of how technology can be utilised to achieve desirable results. The scenario is where learner assessment data, as well as data logging - how often the learner performs tasks in and out of the classroom (taking notes, reading, etc.) is assembled, correlated, and presented in various graphical mediums (spreadsheets, word processing software, interactive web-based practice programmes, etc.) to illustrate, to the learner, a correlation between diligent work-study habits and desirable achievement on assignments. According to the researchers, this sharing of data with learners can cause a change in behaviour, more in particular with regard to behaviour during learning times as well as study habits outside of the classroom. Ultimately, it can have a desired effect on the learner's overall performance.

The example of giving learners data on their performance using technology is an example of a stimulus that can provide the desired response of a learner who is more dedicated during class and more willing to study outside of class. However, while there has been a movement away from behaviourism over the years, the stimulus-response theory is still applicable in today's computer-aided, for example in game-based learning and computer simulations (Ertmer & Newby, 2013). A teacher with an understanding of this theory would need to match the content with the appropriate technological tool to achieve the desired result. However, the researcher believes that this learning theory is very limited in terms of its outlook. While it may still have some relevance in some parts, it has been overtaken by developments over the years. Learners of today are not just receivers of knowledge but also form part of its creation. The discussion will next centre on cognivitism.

2.4.2 Cognitivism

Cognivitism is a learning theory that centres on the processes involved in learning as opposed to observed behaviour (Ertmer & Newby, 2013). While behaviourists focus on outward display

of learning, cognivitists direct attention to the internal processes and connections that take place during learning. Acquisition of knowledge is seen as a mental activity, which involves internal coding and structuring by the learner. The learner is seen as an active participant in the process of knowledge acquisition and integration (Yilmaz, 2011).

Cognitivism underlines the cognitive processes, higher-order thinking skills, and mental representations formed by learners when they are actively acquiring information (Lim and Hang, 2003). According to cognitive theorists, accomplishment comes from the application of critical thinking skills and the understanding of fundamental concepts. Learning is viewed as an active process that involves the acquisition and reorganisation of the cognitive structures through which humans process and store information.

Cognitive psychologists put more emphasis on what learners know and how they come to obtain it than what they do. It is for this reason that the cognitive approach centres on making knowledge meaningful and assisting learners organise and relate new information to prior knowledge in memory (Ertmer & Newby, 2013).

2.4.2.1 Cognitivism in learning and ICT integration

Yilmaz (2011) avers that teaching that is based on cognitive principles should be genuine and true. The teacher needs to give a vibrant classroom environment that promotes a learner's impulsive exploration. Learners also need to be encouraged to explore study materials and to become active creators of their own knowledge through experiences that encourage assimilation and accommodation. For example, Pitler, *et al*. (2007) describe how learners can understand new material being presented better by assimilating technology into their note-taking processes. Learners using Microsoft Word, which is word processing software, can monitor changes made on a particular written passage in order to better summarise the material. This software has a setting, which can automatically summarise a section of the text and give a visual labelling of the most important points.

Pitler, *et al.* (2007) further provide an example where the use of concept maps, when used together with organising material and note-taking can hugely improve learners' understanding of the material. Concept maps are a physical representation of the cognitive processes which occur within the learners' minds for processing, cataloguing, and understanding material. Available software allows teachers to develop concept maps through introductory lessons, discussion of prior knowledge, or as summative assignments that allow learners to visually see connections between questions, concepts, ideas, or words that can be constructed as knowledge within the learner.

Computer-based simulation is another example of cognitive learning. Computer-based simulation is the attempt to recreate an actual process or activity, or on a broader level, model complicated real-life circumstances (Herring 2013). Simulation becomes convenient in circumstances where it is not possible to provide a learner with a situation where he/she can practice what they have learned. The main drawback of simulation is that it consumes a lot of time and money to create. Less resourced schools would probably find it almost impossible to use.

Bingimlas (2009) also highlights the impact of cognitivism on the teaching and learning of the sciences. The use of information and communication technology science of education broadens the pedagogical resources available to teachers. The simplicity of internet access permits teachers to help learners become experts in searching for information instead of just receiving facts.

2.4.3 Constructivism

Constructivism is based on a type of learning, in which the learner forms, or constructs, much of what he/she learns or understands (Gunter & Gunter, 2015). In essence, constructivism suggests that people create their own understanding and knowledge of the world through things that they experience and thinking about those experiences. Constructivism asserts that learning is an activity that is based on the individual learner. The theory suggests that each person will attempt to make sense of all information that they notice, and that each person will, therefore, create their own meaning from that information (Ertmer & Newby, 2013).

According to Driscoll (2000), the constructivist theory avers that knowledge can only exist within the human mind and that it does not have to match any real-world reality. Learners will be continually trying to derive their own personal mental representation of the real world from their perceptions of that world. As they perceive each new experience, learners will constantly update their own mental representations to reflect the new information, and will, therefore, construct their own interpretation of reality. In short, problem-solving is the crux of learning, thinking, and development.

Bhattacharjee (2015) asserts that, at a basic level, constructivism as a theory is based on observation and scientific study about how people learn. When we experience something new, we have to align it with our previous ideas and experience. This is done by altering what we believe or dispensing the new information as redundant. As active creators of our own knowledge, we must ask questions, explore and assess what we know.

2.4.3.1 Constructivism in learning and ICT integration

Researchers have asserted that constructivism, which involves the construction of knowledge based on learners' previous knowledge, is appropriate for e-learning. (Koohang, 2009) proposed a model based on constructivism learning theory in e-learning environments. The model contains three categories for elements of Constructivism. These are:

1. The Design of Learning Activities
2. Learning Assessment
3. Instructor's Roles

The design of learning activities included collaboration, cooperation, perspectives, real-world examples, scaffolding, self-reflection, multiple representations of ideas, and social negotiation. The learning assessment elements consisted of instructor assessment, collaborative assessment, and self-assessment. The instructor's roles were coaching, mentoring, acknowledging, providing feedback and assessing student learning.

Today's learners live in a technologically mediated world (Shrader, 2015). Media forms and moderates learners' views on the world and how they live with the knowledge in it, that is, the way they see knowledge and the way they see themselves. Media such as satellite television, the internet and cell-phones are a part of young people today. Social media use in the classroom provides opportunities for learning, knowledge development, meaning-making, and mind changing. It also gives interactions that provide opportunities for the development of knowledge. Social media is a process by which learners and teachers can co-create the knowledge necessary for the world of work. Furthermore, according to Jones and Bouffard (2012), the use of social media in education has been shown to assist in the advancement of that which is already incorporated in educational goals i.e. the development of care and concern for others, prosocial behaviour, problem-solving, and making ethical and responsible decisions. In addition, Churcher, Downs and Tewksbury (2014) assert that the benefit of media such as Facebook is that the technologies connect with learners where they spend much of their time, which creates virtual communities of practice and a virtual public sphere for discussion. Since each learner brings a distinctive set of experiences to the classroom, the participatory nature of social media allows them the opportunity to become owners of their learning by becoming active in the process of creating knowledge.

Constructivist learning theory has been found effective in the teaching of mathematics in the classroom environment. Moreover, the use of technology in the teaching of mathematics has been seen to result in better overall performance. In a study conducted in Greece, the use of

dynamic mathematics software (DMS) in the teaching of quadratic functions and sequences, an aspect of the subject, showed overall improvement in learner performance. When learner views were sought after the use of the software, it was found that the software enabled a better understanding of the subject matter. The software allowed learners to visualise and concretise the subject. Moreover, it created a pleasant and enjoyable learning environment (Zengin & Tatar, 2014). The researchers in this study emphasise that the role of technology is not to transfer knowledge but to empower a learner to create knowledge and make sense of his/her experiences based on the constructive learning theory.

The use of e-learning resources in the classroom is gaining ground. E-learning resources include technology such as laptops, tablets, multimedia and the internet. Constructivist e-learning emphasises that there are several learning activities and development programmes for learners. Paurelle (2003) avers that this could be done through the use of online resources such as online information and communication resources that are useful for effective learning activity. Practically, this could be done by linking learners' knowledge to other useful online resources and facilitating the learners' journey of discovery and acquisition of new knowledge. According to Sultan, Wood and Koo (2011), e-learning resources can give learners dependable as well as current information that is not available in textbooks. Furthermore, this type of resource can be useful to learners as it can promote their learning and their critical thinking, together with their ability to make connections between different concepts, and bridge the gap between their theoretical and practical knowledge.

The researcher is of the view that the constructivist perspective to learning is more in tune with today's education trends. The evidence just provided shows that it fits perfectly with technologically driven teaching and learning. It focuses on knowledge creation rather than acquisition fall in line with the demands of the 21st-century. This would give learners the skill to find creative solutions to complex problems as they arise.

2.5 THEORETICAL FRAMEWORK

The study will use a set of Standards by the International Society for Technology in Education (ISTE) as the theoretical framework. National Educational Technology Standards for Administrators (NETS-A) 2009 stipulates five criteria that a principal, who is a technology leader, needs to meet. These are visionary leadership, digital age learning culture, excellence in professional practice, systematic improvement and digital citizenship. A discussion of each criterion follows.

2.5.1 Visionary Leadership

Visionary leadership is the first standard the principal needs to reach as a technological leader. In this standard, the principal must have a vision of integrating technology into teaching and learning and to share this vision with the teachers. This, therefore, means the principal must have a continuous and strategic technology plan to support the vision of technology that has been created (ISTE 2009). Mingaine (2013) avers that lack of a clear vision and a strategic plan is likely to result in poor coordination of activities and encumber willing teachers from implementing ICT integration. In addition, the vision and the strategic plan should not be driven by technological but by pedagogical considerations. Mingaine (2013) warns that technological considerations, where features of ICT propel decisions rather than pedagogical decisions, are likely to downplay how ICT would assist learners to learn. Sweeney (2012) outlines the areas that a vision for implementation of ICT should focus on:

- Planning, organising and funding
- Development of staff and ICT infrastructure
- Implementation, improving access and equity
- Maintenance and sustainability of ICT infrastructure at school
- Legal and moral issues of ICT in school
- Education theory, pedagogy and curriculum improvement
- General school administration

Implementation of a vision is problematic at times as it requires the support of the other stakeholders to succeed. Teachers, learners and school governing bodies (SGBs) must be in support of the vision. SGBs are important as they largely represent parents and they control the school finances. The principal needs to gain their support for the successful implementation of the vision. The school can also seek the assistance of private companies and donors to augment the school finances as technology costs can be prohibitive.

2.5.2 Digital Age Learning Culture

The second standard calls for the principal to create a digital learning culture throughout the school. The principal should encourage effective learning by providing enough technological equipment and resources (ISTE, 2009). Apart from this, the principal frequently should serve as a role model for promoting the use of technology. Nevertheless, Mingaine (2013) is of the view that the strength and potential of ICTs need to be seen in relation to other elements of school planning. Implementation costs, staff ICT skills and development, availability of electricity, the school's capacity to sustain implementation, among others, should all be

considered during the planning of implementation in schools by the principal and the management team.

Creating a digital learning culture requires a level of technical expertise that may not be available within the school. It involves the installation of infrastructure such as wiring, cables, and the acquisition of items such as smartboards and computers (Yieng & Daud, 2017). This calls for the involvement of external service providers who can professionally offer the services. But, the reality is that such services prove too expensive for the school and end not being procured.

2.5.3 Excellence in Professional Practice

The third standard calls on the principal to nurture an environment of professional learning and innovation that empowers teachers to promote learning through technological and digital resources. Thus, enough time and resources should be made available to empower teachers to develop themselves as technology professionals. On-the-field training is necessary as Bakir (2016) suggests that teacher training programmes do not adequately prepare teachers to effectively integrate technology into their teaching once they are in the field. The principal's input in the professional development of teachers cannot be underestimated as Chang (2012), who undertook a study of one thousand principals in Taiwan, discovered that principals' leadership improved teachers' literacy and directly had an influence on teachers integrating technology into teaching.

Furthermore, the principal needs to involve him/herself in technology-based professional development. This would allow him/her to be a role model for promoting the use of technological equipment in his/her day-to-day activities in school (ISTE 2009). In supporting this point, Mingaine (2013) further suggests that principals should be prepared to learn about technology to be effective technology leaders. Principals need to possess basic ICT skills. However, Bishop (2012) uncovered that in some schools, principals did not have basic computer skills, which hampers their ability to be instructional and technology leaders. When it comes to technology leadership, there tends to be a presumption that principals have adequate computer skills. However, in most cases, it is a false one. The majority of current principals do not possess sufficient technological knowledge to lead ICT integration. This calls for specific technological training for school management teams to equip them with the necessary skills to lead the integration process.

2.5.4 Systemic Improvement

The fourth standard emphasises the need for the principal to collaborate with the teachers to collect data, analyse data, interpret the findings and share the findings to improve teacher performance and student learning. The school principal provides digital age leadership and management to improve the school through the effective use of information and technology resources. Thus, the principal needs to recruit and retain technologically literate teachers and staff ISTE 2009).

The above point highlights the fact that technology should not be used only for teaching and learning. The capturing, analysis and interpretation of data on learner performance are key roles of technology implementation in schools. These processes allow the principal and teachers to see areas of strength and weakness in learner performance. they assist devising appropriate interventions that can lead to an improvement in learner performance. The South African Department of Education has implemented the use of the South African School and Administration Management System (SA-SAMS) which is a computer application specifically designed to meet the management, administrative and governance needs of public schools in Southern Africa (DBE, 2013). The researcher's opinion is that SA-SAMS has hugely improved the management of learner data in schools though it is underutilised. For example, some schools, including the researchers, are still doing timetabling manually, even though there is a facility on the application that can perform the task.

2.5.5 Digital Citizenship

In this fifth and final standard for technology leadership, the principal has a responsibility to ensure that the school community has equal access to digital resources within the school. This can take place through ensuring that all teachers and learners have access to the technology and connectivity necessary to participate in genuine and engaging learning opportunities. Schools in developed countries can provide access to computers due to the wide availability within schools (2009). However, in the majority of schools, this is not possible due to the shortage of ICTs (Mdlongwa, 2012). Some schools can only offer very limited access due to a few computers. Schools can increase access by improving timetabling to give balanced access to the school community.

The introduction of technology, including internet access, has brought challenges for schools. There is always a possibility of learners accessing undesirable websites instead of those with learning content. Digital citizenship suggests that the school principal cultivates responsible online behaviour, including safe, ethical and legal use of technology among users (ISTE, 2009). Learners need to be educated on the dangers of using online resources irresponsibly

as it can have negative consequences on their learning. The involvement of parents in this regard is key, as some of the unacceptable habits may have been learned at home.

2.6 BARRIERS TO CLASSROOM TECHNOLOGY INTEGRATION

It has become widely accepted that the use of Information and Communication Technologies gives learners the potential to improve learner knowledge and skills to promote co-operative and autonomous learning (Kirschner, Pearson, Niemi, Davis & Selinger, 2003; Madumere-Obike & Imgbi, 2012). Bingimlas (2009) is of the view that technology has the power to support education across the curriculum and provides opportunities for effective communication between teachers and students in ways that have previously not been possible. According to Delgado, McKnight and O' Malley (2015), the digital revolution has changed the way people find information. The internet allows access to more information than any one person could ever acquire available at one's fingertips. Therefore, the drive for classroom ICT integration incorporates a mission to optimally increase 21st-century opportunities for future generations (Makki, O'Neal Cotton & Rikard, 2018).

However, technological advancement in education has not come without some challenges. Ertmer (2009) provides a model of the barriers identified which affect technology integration in education. There are two types of barriers. On the one hand are *first-order barriers* which are extrinsic to teachers. These barriers include lack of access to computers and software, inadequate time to plan for lessons, and insufficient technical and administrative support. These barriers are, according to Ertmer (2009), incremental and institutional. On the other hand, are *second-order barriers* which are intrinsic to teachers and include beliefs about teaching, beliefs about computers, established classroom practices, and unwillingness to change. Ertmer (2009) is of the view that, while *first-order barriers* may be removed by securing additional resources and providing computer skills training, dealing with *second-order barriers* requires confronting one's belief systems and the entrenched routines of one's teaching practice. But Tsai and Chai (2012) suggest there is a *third-order barrier.* This barrier includes factors related to teachers' design thinking which may serve to restrict teachers' use of technology in the classroom. Teachers' design thinking refers to the vital creation of knowledge and practice by teachers when they are faced with the advancement of ICT and its associated pedagogical advantages. Tsai and Chai (2012) assert that conquering third–order barriers can help address first- and second-order barriers as teachers successful in the domain will learn to treat all barriers as problems that need to be addressed through human and creative thinking.

Mishra, Koehler, Shin, Fedor, Francis, De Schryver and Heintz (2009) suggest three reasons why efforts to successfully integrate technology into teaching sometimes have less than desired outcomes. First, the use of the latest technology requires precise knowledge of how to use it for teaching purposes. Teachers, due to their busy schedules, are not always skilled beyond the basic usage of technology. Furthermore, technological tools require completely different skills to accomplish instructional goals. Second, teachers' value beliefs play an important role in their teaching decision-making. This point concurs with Ertmer (2009) *second-order barriers*. This compounds the poor success of integration as teachers tend to bring a variety of pedagogical beliefs into the classroom which are borne out of years of observation of previous teachers and family members at home. These beliefs contribute to teachers' notions of how teaching and learning work. Third, the focus has mainly been on the technology rather than on how to approach the subject matter with the technologies.

But, according to Ottenbreit-Leftwich, Glazewski, Newby and Ertmer (2010) teachers' dispositions and historical experiences can be conquered through appropriate professional development which is aligned to teachers' values and beliefs. In a study these researchers conducted to examine how and why teachers used technology to enhance teaching and learning, the following value beliefs were identified. First, teachers value technology towards the improvement of parent-teacher communication. Second, teachers value technology that enables them to customise teaching materials focused on specific learning needs. Third, teachers value technology that assists them to address professional development needs, communicate and collaborate with colleagues and authorities. Fourth, teachers value technology that assists them to engage and motivate students.

While lack of technical support is also cited as a barrier to technology integration, surprising findings were made by Malaysian researchers. Raman and Yamat (2017) set out to find the reasons why some teachers in a technologically, highly resourced Chinese English language private school were refusing to integrate ICT tools in their teaching. The major barrier discovered by the researchers was reluctance on the part of teachers to integrate technology into their teaching. Other barriers teachers cited, among other reasons: focus on completing the syllabus on time, learners were mature enough and did not need audio or visual strategies for teaching, and difficulty to manage learners if ICT was used in the classroom. The teachers also cited heavier workloads, which made them unable to cope with the pressure preparing and practicing integration into lessons. Teachers felt that there was not sufficient time to prepare lessons as they were too busy accomplishing the goals of the syllabus. Teaching experience and age were other barriers discovered. The older teachers with more experience

preferred not to use ICT tools in their English classes as they felt they were too old to adapt to the new teaching styles. To the older teachers, traditional ways of teaching were preferred.

2.7 CONCLUSION

The chapter began by examining teaching and learning in the 21st-century. This was followed by a discussion on leadership in the use of technology in schools. Learning theories in relation to the use of information and communication technologies in teaching and learning were then discussed. The chapter then focused on National Education Technological Standards for Administrators (NETS-A) 2009, which provides a conceptual framework for the study. The chapter concluded with a discussion on barriers to the use of ICTs in schools.

CHAPTER 3

TECHNOLOGY INTEGRATION IN TEACHING AND LEARNING

3.1 INTRODUCTION

This chapter will focus mainly on the role of technology use and integration in teaching and learning. It will begin with a rationale for the use of computer technology in education. This will be followed by an examination of the policies of technology use in education in different countries. These countries are Canada, Finland, Malaysia, Kenya and South Africa. The chapter will continue with a discussion on the impact of information and communication technologies on learners. The role of school management in the use of ICTs will be discussed. The chapter will then look into educators and the use of technology in the classroom. Factors facilitating technology use in teaching and learning discussed. The chapter will close with a discussion on factors impeding teachers from using ICTs in the classroom.

3.2 RATIONALE FOR THE USE OF TECHNOLOGY IN EDUCATION

Today, the role of educational technology in teaching has become of great importance due to the use of information and communication technologies. Furthermore, technology and digital media can be found everywhere and are integrated into every aspect of people's lives (Gunter & Gunter, 2015).

According to Stosic (2015), educational technology has three areas of use. Firstly, technology can act as a teacher. Here the computer gives instructions and guides the user. Secondly, technology can act as a teaching tool. Thirdly, technology can act as a tool for learning. But, Simin and Sani (2015) caution that technology in the classroom should not be seen as replacing the teacher but as a complementary tool meant to assist both the teacher and learner to achieve pedagogical goals. This point is critical because technology without the teacher is useless. The teacher decides how technology is to be utilised during the teaching and learning process, and not the other way round. Here, the role of the principal, as a technological leader becomes key as he/she guides the integration process towards achieving its goals.

3.3 TECHNOLOGY IN EDUCATION POLICIES IN OTHER COUNTRIES

The study will now investigate education policies in other countries. The countries have been chosen based on their different socio-economic situations, and will assist in obtaining insight into what can be achieved through the possibilities offered by technology use in their education

systems. These countries are Canada, Finland, Malaysia, Kenya and South Africa. Canada and Finland represent developed countries while Malaysia, Kenya, and South Africa represent developing countries. The purpose of the investigation is to enquire how other countries are dealing with the introduction of technology in teaching and learning and to draw lessons that can be applied in the South African education setting.

3.3.1 Canada

Canada is the second-largest country in the world with a population of about 33 million as of 2007 (CODE, 2011). More than 80 percent of the population lives in urban areas.

In 2006, almost all schools in Canada had computers. This provided one computer for five learners. Ninety-eight percent of schools had an internet connection. The computers were used for word processing, research and individualised and online learning. Small and rural schools receive an online provincial curriculum through distance learning. Moreover, a wide range of technology-television, print, teleconferencing and online is used in the classrooms and distance learning throughout the country (CODE, 2011).

Canada does not have a single national, integrated department of education. However, within its federal system of shared powers, the country's constitution allows each province to make exclusive laws in relation to education. The country has 13 jurisdictions with each having a department or ministry of education responsible for the organisation, delivery, and assessment of education at all levels.

In view of the Canadian government's federal system, only the province of Ontario's jurisdiction will be studied. In this province, both the Ministry of Education and school boards have crucial roles in the delivery of e-Learning. The Ministry gives leadership and support, while school boards retain overall responsibility for the implementation of blended learning, e-learning credit courses, and the use of digital resources. To expand on these points:

The Ministry of Education

- Acquires and oversees a provincial Learning Management System (LMS) for online blended learning, e-learning credit courses, and the Ontario Education Resource Bank for digital resources.
- Sets policies for board participation in the e-learning effort.
- Coordinates the development of digital learning resources, including e-learning credit courses and course/subject packages.
- Provides professional development opportunities for face-to-face, webinars and focused video tutorials.

School Boards

- Maintain all aspects of e-learning delivery within the board, including registering and tracking learners, granting credits, hiring staff, setting programme direction, and maintaining over quality.
- Customise courses and digital learning resources to meet local needs, while ensuring that they meet the expectations in the appropriate curriculum policy documents.
- Make sure that all relevant Ministry of Education policies including the e-learning policy and ancillary acceptable use policies are adhered to.
- Need to have an approved technology plan, which guides, supports and directs the use of technology for the 21st-century. These plans are the cornerstone of student learning and focus on socially active acquisition of critical thinking, problem-solving, and communication and collaboration skills. Components of a board technology plan could include funding sources, links to board improvement plans, governance and policies, infrastructure, leadership development, capacity building, learner devices, teacher devices, digital resources, library transformations, digital citizenship, equity of resources, social media, pilot projects and pedagogy progression.

While within the legislation there are no specific requirements for supervisory officers/directors about technology use in classrooms, in the broader context of legislation, these officers have the ultimate responsibility for the implementation of programmes according to Ministry of Education legislation, policy and programme memoranda, and curriculum policy documents. One of the essential components of these programmes is the effective use of technology as a 21st-century skill. A supervisory officer/director should be knowledgeable about the transient nature of technology and should demonstrate life-long learning. The director is a spokesperson to the board, teachers, parents, learners and the community, and an advocate who values technology, embraces it and promotes it. According to the policy, leadership in technology is not only about what is required, but also about what a supervisory officer/director envisions values and practices (CODE, 2011).

To put the above points into context, the province has made a significant investment into telecommunications infrastructure by improving bandwidth for faster internet connections. In addition, wireless infrastructure has been put in place to allow internet access anywhere in the school and to allow learner devices to access the internet. On the hardware side, interactive whiteboards have replaced traditional blackboards, while LCD projectors have replaced overhead projectors in each class. Teachers have laptops, document cameras, and response systems, which allow for quick assessment of learning (CODE, 2011).

A notable idea practiced in Canada with regard to learners is Bring Your Own Device (BYOD). Learners are encouraged to bring their own ICT gadgets to connect to the schools' wireless network. Hence, learners are using iPods, iPads, iPhones, tablets, netbooks, laptops, and other smartphones to access educational resources over the internet (CODE, 2011).

3.3.2 Finland

The researcher chose to study ICT integration in Finland due to the achievement of the country's learners in international comparative assessment studies. Finnish learners have consistently scored at or near the top in international comparative assessment studies such as Trends in Mathematical and Science Study (TIMMS) (Thayer, 2012).

In 2010, the Finnish government produced the National Plan for Educational Use of Information and Communications Technology. The plan was a result of a three-year project titled "ICT in Everyday School Life" whose purpose had been to produce operating models aimed at establishing the use of ICT in education and drawing up a national plan (National Plan for Education Use of ICT, 2010).

This National Plan for Educational Use of Information and Communications Technology outlines the strategic policies and actions formulated. The actions focus on the following eight topics:

3.3.2.1 National Objectives and Systemic Change

The policy begins by explaining the role of national objectives and systemic change. While national objectives establish the foundation for educational use of ICT as part of all schools' operations, systemic change brings about actions that promote the development of the school system as a whole. For the effective implementation of change, a clear vision, strategic intent a strategic leadership should be in place. As a result, new procedures will be introduced into the whol educational system to increase the flexibility of studies and make everyday school life easier (National Plan for Education Use of ICT, 2010).

In view of the above, the policy makes recommendations for action. Firstly, systemic change should be reinforced and cooperation between central government and education service providers should be strengthened to put national objectives into practice. Secondly, the prevailing monitoring and self-evaluation systems should be developed together with education providers. The methods in which ICT is to be employed in education and quality improvement should be assessed at all levels. Thirdly, the strategic leadership of education providers should be strengthened. This will allow for proposals for action to be cascaded to education providers while enabling their implementation at a local level. Fourthly, the policy

proposes the formation of an online national interactive educational service that would cover various web-based open and commercial platform alternatives, web-based learning environments, etc. Lastly, the policy asserts that it would be advisable to continue with national developmental projects while also launching a wide Research and Development programme. This would assist in making it possible to teach and implement innovations developed by teachers, businesses and researchers at schools (National Plan for Education Use of ICT, 2010).

3.3.2.2 Learners' future skills

According to the Finnish policy, ICT should be used at school to develop citizenship skills. The purpose is to develop learners' skills in applying information in everyday school life and outside school. ICT should also be used to consolidate collaborative working skills. Moreover, ICT skills that support collaboration should be used to spread and combine information. The policy further advises that ICT tools and applications that support learners' individual pathways be put in place. Furthermore, it stresses that efforts should be made to ensure that learners develop sufficient abilities to operate online socially, creatively and ethically while recognising the rules of society and the school (National Plan for Education Use of ICT, 2010).

3.3.2.3 Pedagogical models and practices

The policy recognises that, according to the current conception of learning, a learner is an active participant and explorer. It is, therefore, prudent to embrace activating and participatory working methods and teaching practices based on the most recent research. To support collaborative learning, ICT enabled working methods should be put in place. This should result in a move away from mere transmission of information to producing ideas and combining information (National Plan for Education Use of ICT, 2010).

3.3.2.4 e-Learning materials and applications

In recognition of the fact that availability, accessibility and innovativeness of materials play a crucial role in terms of utilising e-learning materials in education, the policy proposes that

- Production should focus on experiential e-learning materials that promote thinking skills. In this regard, teaching and learning should make use of games and opportunities *augmented reality* (this means examining geographical information, for example, in real-time by means of a movable interface).
- E-learning materials should be compiled in such a way that they can be accessed through a single search tool.

- All schools should be able to access materials offered by national digital data repositories, cultural institutions, information services and memory organisations.
- Legislation should be reformed in terms of value-added tax (VAT) treatment of e-learning materials.
- Cooperation should be created between educators and publishers of learning materials in order to develop e-learning materials (National Plan for Education Use of ICT, 2010).

3.3.2.5 School infrastructure, learning facilities, purchases and support services

The policy asserts that information and communication technology use requires up-to-date and user-friendly infrastructure and equipment. To this end, modern tools are put in place at those schools where teaching equipment does not meet current standards. Furthermore, schools should have high quality, compatible and cost-efficient technical solutions.

Among the proposals found in the policy document are that school equipment should be in line with common international technical and e-learning standards approved in Finland. Open interface requirements should be determined for learning applications; teaching facilities should be equipped with fibre-optic connections in cooperation between central government, education providers and businesses; ICT usage rates in minimally populated areas should be taken into account during implementation.

The policy further states that teachers and learners need to have access to necessary and up-to-date equipment and the internet. The target level for the standard of ICT equipment for teachers and learners needs to be specified. School-specific and regional teaching support should be arranged. In this regard, education providers should mould a support system to ensure real-time technical support for teachers in the form of remote electronic and on-site support (National Plan for Education Use of ICT, 2010).

3.3.2.6 Teacher identity, teacher training and pedagogical expertise

The policy recognises that the ICT skills of newly graduated teachers vary depending on the teacher training college. Teachers do graduate from college without the requisite skills in the use of ICT and media skills. As a result, teacher-training institutions need to acquire up-to-date equipment. Secondly, teacher-training faculties should make modern degree requirements and practice with regard to the educational use of ICT and media education. Thirdly, the trainers of teachers in initial and continuing education and student teachers need to be provided with methods and models based on the latest research for educational use of ICT use of media. Lastly, themes aimed at developing competencies in the educational use of

ICT and network cooperation should be added to teachers' professional development programmes and initial training curricula (National Plan for Education Use of ICT, 2010).

3.3.2.7 Operational culture and leadership at school

The policy recognises the important role played by the school management in the successful introduction of ICT within the school. Therefore, school principals and their assistants should have a positive influence on teachers' outlook on ICT. School management needs to have a powerful vision of the role of ICT in education, studies, administration and development of the school's operational culture. Managers also need to participate in long-term development undertakings about how to achieve the objective (National Plan for Education Use of ICT, 2010).

The policy proposes that

- Cooperation between educators should be strengthened. There should be teams of teachers given the responsibility of organising teaching while also developing other methods that support and enable teachers' collaboration and co-configuration.
- There should be development of the competences of teaching staff and school management.
- A factual information package should be compiled for policy-makers, education providers and school management, covering the opportunities of using ICT and media in education.
- Schools' management culture should be bolstered by supporting leadership and teamwork through a peer support system. This should be done by providing schools with support for developing their management practices, making use of the latest technology (National Plan for Education Use of ICT, 2010).

3.3.2.8 Business and network co-operation

The role of business in ICT integration at schools is not ignored. Businesses provide school services that support school operations and the development of learning environments. The policy proposes the creation of ethical ground rules and policies for business and network co-operation. Resources should be allocated for launching network co-operation. Furthermore, businesses and schools should be provided with an information package dealing with opportunities and schools' needs in terms of ICT.

The policy further calls for an increase in co-operation with the world of work. This should be done by providing teachers and learners with opportunities to familiarise themselves, using ICT with the world of work.

Schools also needed to be supplied with standard overall concepts that cover products offered by businesses. These should be accompanied by orientation, training and support, and maintenance services (National Plan for Education Use of ICT, 2010).

3.3.3 Malaysia

Malaysia introduced the first computer system in 1966. Since then, the Government has implemented various initiatives to enhance the wider adoption of ICT to improve capacities in every field, including education (Chan, 2010). The Ministry of Education (MOE) views ICT as a means, not an end in itself. Consequently, all efforts are aimed at developing new media as tools for the provision of richer curricula, enhanced pedagogies, more effective organisational structures in schools, stronger links between schools and society, and the empowerment of disadvantaged learners.

The MOE has formulated three main policies for ICT in education. The first policy is that of ICT for all learners. This means that ICT should be used as a tool that reduces the digital chasm between schools. The second policy emphasises the role and function of ICT in education as a teaching and learning tool, as part of a subject, and as a subject itself. Apart from radio and television as a teaching and learning tool, this policy emphasises the use of the computer for accessing information, communication, and as a productivity tool. ICT as part of a subject refers to the use of software in subjects such as “Engineering Drawing” and “Invention”. ICT as a subject refers to the introduction of subjects such as “Information Technology” and “Computerisation”. The third policy emphasises using ICT to increase productivity, efficiency and effectiveness of the management system. ICT will be widely used to automate and mechanise work processes such as the processing of official forms, timetable generation, management of information systems, lesson planning, financial management, and the maintenance of inventories.

To put these policies into practice the MOE launched the Smart School Flagship project in 1997. The objective of this project was as follows:

“The Smart School is a learning institution that has been reinvented in terms of teaching and learning methods and school administration system in order to prepare the students for the Information-Based Society. Creativity and better management of information is facilitated through the use of technology where students, teachers, administrators and parents are better prepared for the challenges of the Information Age.” (MOE 2010:10).

The Smart Schools Roadmap propels the School Flagship project. This roadmap is broken into four main stages of development known as “Waves”. For each “wave”, key milestones are

identified. Under Wave 1 (1999-2002), which was the Pilot Phase, 88 schools selected were to be developed into Smart Schools. The MOE supplied these schools with materials, skills and technologies it had developed.

After the pilot phase, Wave 2 (2003-2005) followed. In this wave the MOE implemented initiatives such as computer labs, teaching of science and mathematics in English, SchoolNet, courseware, and e-material.

In Wave 3 (2006-2010), the critical milestones of making all schools smart, EduWebTV and Access Centre were established. To encourage active interest and participation of schools, a measured and graded benchmark of ICT use in the Smart Schools was created and this is known as the Smart Schools Qualification Standards (SSQS). The “Star Ranking” system was used to appraise each school in terms of Utilisation (40%), Human Capital (40%), Applications (10%) and Technology Infrastructure (10%). To qualify as a Smart School, the 10 000 schools must achieve the minimum conditions of 3-star specified for each Key Performance Indicator (KPI) within the four areas specified. The performance indicators seek to show how ICT should be used not only as a basic operational tool but also as a critical enabler for education that promotes the development of creativity, collaborative learning, critical thinking and problem-solving (MOE, 2010).

Under Wave 4 (2010-2020), the Smart School Flagship Application enters the “Consolidate & Stabilise” stage. This is where creative ways of using ICT in Education become noticeable. It is also at this stage that the Smart School Flagship project takes the form of a broader ICT in Education concept (MOE, 2010).

Indeed, as Malaysia is entering the last stage of the Smart School Flagship Roadmap, there is a gradual move away from the Smart School concept to a broader and more inclusive ÏCT in Education” concept. This concept is a wider notion and operates in a bigger scheme to the “Smart School” initiative. The broader concept includes combining multi-lateral efforts from all stakeholders. These stakeholders are from the MOE level to the school and educational institutional level. They also include the Community of Practice (COP) that is a body made up of experienced teachers, industry practitioners, alumni, parents and learners. These parties can provide constructive feedback on user requirements and areas of improvement to solidify the approach of integrating ICT in education (MOE, 2010).

3.3.4 Kenya

The Republic of Kenya is located on the equator where it is bordered by the Indian Ocean, Uganda, Tanzania, Ethiopia, South Sudan, and Somalia. In 2018, Kenya had an estimated population of 50 million (World Population Review, 2018).

The Kenyan government has put in place the National ICT Policy and E-Government Strategy that provides guidelines for the transformation of the country into a digital society. In both documents, the government recognises that an ICT literate population is the foundation on which the nation will become a knowledge-based economy. It is against this background that the government will make education a platform for equipping the nation with ICT skills to forge dynamic and sustainable economic growth (DOE-Kenya, 2012).

3.3.4.1 E-Government Strategy

In 2004, the government adopted the E-Government Strategy, which highlights the conversion of government services from manual to digital-based operations. For the government to achieve its specific objectives, the Strategy emphasises the use of education to equip the nation with the requisite ICT competencies and skills and related innovations.

Furthermore, the Strategy outlines information systems to be driven by the education sector. These include operationalisation of the Education Management Information System (EMIS). EMIS will be used to collect and process data required for improvement of education policy, planning, implementation and monitoring. It also includes the provision of online examinations, processing admissions for primary and secondary schools and online dissemination of school and other educational curricula (DOE-Kenya, 2012).

3.3.4.2 National ICT Policy

The main goal of the National ICT Policy is to enable sustainable economic growth and development, and eradication of poverty through productive and effective technologies. In the field of human resource development, the policy emphasises integrating ICTs in teaching curriculum at all levels of education. This includes: the establishment of e-educational networks for sharing educational resources and promoting e-learning at all levels; encouraging and supporting ICT training for decision-makers, community and civil society leaders; creating opportunities and providing assistance for the disadvantaged, women and youth to acquire ICT competencies and skills; and enhancing capacity for research and development in the ICT sector (DOE-Kenya, 2012).

3.3.4.3 Strategic Components of the Kenyan ICT policy on education

The policy contains eleven strategic components that drive the vision of the Kenyan ministry of education. However, only seven components are highlighted in this study due to their proximity to the parameters of the study. While the policy outlines what needs to be achieved, it also recognises some of the shortcomings that the country has in achieving its vision (DOE-Kenya, 2012).

3.3.4.3.1 ICT in Education Policy

There is recognition that the existing policy on ICT in education is embedded in three separate documents, namely; e-Government Strategy, National ICT Policy and Sessional Paper No.1 of 2005. There is a need, therefore, to consolidate these documents into one. This would ensure that the relevance and currency of ICT policies and strategies were maintained. It would also ensure a broader base for ownership by involving as many stakeholders as possible (DOE-Kenya, 2012).

3.3.4.3.2 Digital Equipment

Whereas the majority of secondary schools in Kenya have some computer equipment, only a few are equipped with basic ICT infrastructure. In primary schools, the situation is dire. It is for these reasons that some of the strategic objectives of the policy on ICT are to equip education institutions with digital equipment to enhance the integration of ICT in education in the regions of the country. The policy also seeks to support initiatives that provide digital equipment to educational institutions, the priority being secondary and primary schools (DOE-Kenya, 2012).

3.3.4.3.3 Connectivity and network infrastructure

Kenya has major connectivity and network infrastructure challenges. There is low penetration of the physical telecommunication infrastructure, especially in rural and low-income areas. Some of the strategic objectives of the ICT policy are to

- Encourage the establishment of cost-effective and functional networked computer laboratories in educational institutions.
- Enhance the provision of connectivity to education and training institutions through a payment rate agreed to with service providers.
- Support the sharing of connectivity infrastructure and costs by educational institutions and communities to ensure sustainability (DOE-Kenya, 2012).

3.3.4.3.4 Access and Equity

Kenya is characterised by a wide variation in resource endowment that results in disparities. The policy, therefore, seeks to expand access and equity in the delivery of educational services and curricula. The main objective is to give priority to disadvantaged areas, communities, educational institutions, teachers and learners. To achieve this objective, the policy seeks to promote access to ICT infrastructure by connecting all remote educational institutions through the internet and support the establishment of a National Educational Portal (NEP). Furthermore, the policy seeks to improve access to ICT facilities for the educational purposes of pupils, parents and the local community, in partnership with libraries and other services, and using school ICT facilities after school hours (DOE Kenya, 2012).

3.3.4.3.5 Technical Support and Maintenance

There is limited capacity for the effective use and maintenance of ICT infrastructure at Kenyan educational institutions. Most schools use less than 40% of the available ICT infrastructure and that calls for a need to ensure optimum use of ICT resources by learners, teachers and administrators. Furthermore, authorities have noted that very few schools use ICT as an alternative method for the delivery of the curriculum. The policy, therefore, seeks to improve the use of ICT infrastructure to over 70% at the educational institutions thus ensuring expanded use of ICT as an alternative method for the delivery of the education curriculum and administration (DOE-Kenya, 2012).

3.3.4.3.6 Integration of ICT in Education

It is notable that, while in other countries integration of ICT to teaching and learning is up to 41%, the proportion in Kenya is low. ICT integration aims to support teaching and learning in the delivery of the various curricula to achieve improved educational outcomes. The interactive nature of ICT facilitates learners to develop diversified skills required for industrialisation and a knowledge-based economy. It also allows teachers to proceed at different paces depending on the prevailing circumstances. The policy recognises that integration of ICT to teaching and learning will play a major role in preparing learners for the demanding job market. In recognition of this, some of the objectives are, firstly, to establish model educational institutions that will be used to demonstrate the integration of ICT to teaching and learning. Secondly, to train master integrators to support integration at the national and district levels. Thirdly, to train teachers on integration techniques and sensitise education managers on ICT integration (DOE-Kenya, 2012).

3.3.4.3.7 Training (Capacity Building and Professional Development)

The policy recognises that the rapid change in ICT demands continuous training at all levels. Therefore, training programmes for the education management sector to undergo training in EMIS will be implemented. The entire teaching staff, comprising both primary and secondary school teachers, is to be trained in ICT literacy and integration. The strategic objectives of this exercise would be, firstly to build capacity in ICT skills for all players in the education sector. Secondly, to build the capacity of education sector managers to use ICT tools to enable better delivery of educational services. Thirdly, to sensitise all stakeholders on ICT integration. For teachers, the objective is to build capacity for at least one teacher in each school to teach ICT, support ICT literacy and integration and basic maintenance of ICT equipment.

Through the policy, the vision is that all levels of the education sector will be ICT-literate, education managers will be able to support ICT integration in the institutions, and teachers will have the ability to improve teaching and learning in schools (DOE Kenya, 2012).

3.4.5 South Africa

At the onset, it should be stated that information on ICT in the education landscape in South Africa might be outdated. The researcher has found it difficult to obtain recent information on the state of ICT in education in South Africa. The bulk of the information cited is based on the White Paper that was published in 2004. The researcher could not locate new information that followed the release of the White Paper.

The White Paper begins with an acknowledgement of the impact of the policies of the apartheid dispensation. The imbalances that exist in terms of resource provision, especially between provinces, are highlighted. Provinces such as Gauteng, Western Cape and Northern Cape have better ICT resources compared to the rest (DoE, 2004).

The Department of Education is of the view that developments in ICT create access to learning opportunities, redress inequalities, improve the quality of learning and teaching and deliver lifelong learning. Observations made globally suggest that ICT does play a role in the transformation of education and training. Teachers and learners can leave behind traditional approaches to teaching and learning. This takes place when there is a move from teacher-centred, task-oriented, and memory-based education to an inclusive and integrated practice. This further allows learners to work collaboratively, engaging meaningfully in contexts that develop creative thinking and problem-solving skills (DoE, 2004).

In view of the above, the policy envisages that every learner in the general and further education bands will be ICT capable. This means the use of ICT confidently and creatively to

help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community by 2013. The achievement of this goal would require the development of schools that are learning organisations consisting of a community comprising both teachers and learners. In such schools, teachers and learners would be able to think about what is worth knowing about education and new technologies along three dimensions. These were operational, cultural and critical (DoE, 2004).

To explain these dimensions, the operation would attend to the skills that are necessary for the utilisation of new information and communication technology. To acquire these skills, human networking among teachers and learners would become paramount to facilitate a collective approach to knowing and problem-solving. To expedite collective learning, provincial departments would establish opportunities for schools to learn together and from each other about ICT in education (DoE, 2004).

The cultural dimension deals with stepping into the culture that supports the practice of using ICT for educational purposes, without taking into regard one's level of expertise. This would require teachers to move beyond seeing technology as an additional learning instrument but to view technology as something that presents interesting and important questions for administration, curriculum and pedagogy (DoE, 2004).

The critical dimension implores teachers and learners to desist from taking for granted the assumptions that exist about the success of ICT inside and outside the classroom but critically pose questions about these. This requires a critical dialogue among teachers and researchers to expand teachers' perspectives on the benefits of ICT (DoE, 2004).

The policy further states that e-schools would be characterised as institutions that have learners that use ICT to heighten learning. The schools will have qualified and competent leaders who use ICT for planning, management and administration together with qualified and competent teachers who use ICT to strengthen teaching and learning. Furthermore, the schools will have access to ICT resources that support curriculum delivery; and connections to ICT infrastructure (DoE, 2004).

The ICT policy in education also views a connection with the community as critical. These schools will become a resource for community improvement by allowing the community access to their computer facilities after hours.

As an arm of government, the Department of Education would determine the basic ICT tools to be supplied to an institution defined as an e-school (DoE, 2004).

3.4.6 Analysis of the five countries' ICT policies

In all the surveyed countries' policies, there is recognition of the importance of ICTs in fulfilling their educational goals. The countries see ICTs as a necessity to prepare learners for the needs of the twenty-first century knowledge economy. However, there is a marked difference at a broad national level between the approaches of developed countries and the developing countries. Canada and Finland have set roles for responsibility down to the level of the schools. Every level of responsibility has a clearly defined role of what is expected of it. School boards in the case of Canada, for example, have a function that is demarcated. This approach facilitates accountability and makes it easier to see where strengths and weaknesses are in the system. In comparison, the developing countries surveyed, only have broad policy guidelines which do not indicate where the responsibility for implementation, for example, lies. The downside of this can be seen in the case of South Africa where some provincial education departments, such as Gauteng, have taken the initiative and implemented e-education while other provinces have not done so (John, 2015).

In all the developed countries, the school management is seen as the implementer and driver of ICT integration in teaching and learning. Canada, for instance, insists on the technology leader to have an understanding of the ever-changing nature of technology. This would assist in ensuring that schools remain up-to-date with technological trends and developments. The Finnish system emphasises the importance of a strong vision on the part of the principal about the role of ICT in the education of learners. The support given to teachers by school management is seen as crucial to achieving educational goals.

The Finnish and Kenyan policies emphasise the importance of training to upskill teachers and school managers in the use of ICTs. In Finland, teacher-training colleges are expected to update their curricula to include the use of ICTs in teaching. The creation of networks of teachers for professional development are emphasised. This is an important point as it prevents teachers being outdated.

The provision of computers is key towards the realisation of ICT goals. Canada, Finland, and Malaysia have supplied almost all their schools with computers. However, Kenya has struggled to do the same (see 3.2.4.3.2). South Africa is also struggling to meet its computer supply targets (Nkula & Krauss, 2014) due to a variety of factors. This has a detrimental effect on the countries' goals of preparing learners for the knowledge economy of the future. These two countries will need to reprioritise their national budgets to effect more investment into their education systems as the present situation hampers human resource developmental goals.

3.5 LEARNER PERCEPTIONS ON CLASSROOM USE OF ICTs

The purpose of this section is to explore how learners perceive the use of technology in the classroom. The integration of information and communication technology in the classroom has become a priority at most levels of the curriculum in many countries around the world (Lang, Craig & Casey, 2017). This evolution has led to a shift in pedagogical approach from the more traditional teaching methods to newer ones. The customary classroom setting, where the learner is viewed as a passive consumer of educational knowledge, has been replaced by a classroom in which learners are seen as active participants and collaborators in the sharing of information (Montrieux, Vandelinde, Schellens & De Marez, 2015). The impact of technologies in the classroom can be seen in Malaysia, where broadband penetration had reached 66 percent in 2012 (Ministry of Higher Education Malaysia, 2012). This penetration has propelled web-based technologies, Web 2.0 tools, and interactive multimedia content into the classroom.

Transformation to a more technology-based learning approach has resulted in researchers studying how computers can be used effectively in schools. While the assertion is often that today's learners were raised in the information-rich generation with developing digital media, high tech devices, internet resources, which make them more interested and more capable in using technologies in their learning environment, in less developed countries, the situation is different.

For the classroom use of technology to be successful, Hattie (2013) suggests the following conditions: First, there has to be diversity in teaching strategies. Second, pre-training in the use of computers as a teaching and learning tool has to take place. Third, there must be multiple opportunities for learning (e.g. deliberative practice, increasing time on task). Fourth, the learner, rather than teacher, should be in control of learning. Fifth, peer learning is maximised. Sixth, feedback is maximised.

Furthermore, technology-based learning requires learners to have a certain level of computer skills for learning to be effective. Learners have to be digitally literate. The European Commission defines digital literacy as confident and critical use of ICT for activities such as work, leisure, learning and communication (JISC InfoNet, 2012). Researchers Hall, Nix & Baker (2013) opine that digital literacy consists of two forms. Firstly, there is information literacy (IL) which is the ability to find and make use of information, including searching for, evaluating and referencing of information. Secondly, Information and communication technology (ICT) skills, defined as the skills needed to organise, present or share information using a computer, word processing, spreadsheets, email and presentation software.

A country's economic situation determines what types of ICTs are available, which is why schools use a variety of devices to achieve their ICT goals. Laptops, tablets and smartphones are commonly available in classrooms to perform the work at hand (Ragan, Jennings, Massey, & Doolittle, 2014). In addition, low-cost PCs and smartphones are increasingly being used around the world (Islam & Grönlund, 2016). This wide use of technology is fuelled by the concept of one-on-one computing. The concept refers to every learner having access at all times to a computing and communication device to use in schoolwork as a personal tool (Islam & Grönlund, 2016). One-on-one computing allows individual learners immediate access to a wide range of information, web-based resources and learning communities anytime anywhere (Bebell Kay, 2010). Its goal is to improve learning in general as well as to contribute to the development of twenty-first-century skills such as creativity, critical thinking and communication skills.

Spektor-Levy and Granot-Gilat (2012) conducted a study in Israel to examine the impact of one-on-one computing on the implementation of learning skills, information literacy, and the use of computerised tools among learners. One group had continuously studied in 1:1 classes with personal computers while the other studied in regular classes with no technology. The research tool consisted of a complicated, computer-based task. To complete the task, learners had to apply skills such as information retrieval, information evaluation, reading comprehension, information processing and representation, and knowledge presentation. The findings of the study showed that learners from the 1:1 class performed considerably better than the others from the comparison group. The results indicate the positive effect of learning with personal laptops and routinely available ICT on learners' achievements and competences.

In another study conducted in Swedish elementary schools, the researchers investigated how learners interacted through ICTs during their classroom-learning environment and how ICTs contributed towards their competencies building processes. The researchers found that learners became more concentrated, calm, structured, engaged and amused when working with computers than the traditional way of learning (Sahlin, Tsertsidis & Sirajul Islam, 2017).

Researchers Olofsson and Lindberg (2018) undertook a study to determine learners' views on how ICT could structure and support their everyday activities and time at school. The researchers discovered that learners used ICT for ongoing digital documentation and saw Google Drive and the laptop hard drive as easily accessible containers for storage and for searching for material to solve school assignments. Furthermore, learners regarded ICT as a tool that supports oral presentations and the taking of structured notes during lessons. With regard to the use of smartphones in the classroom, some of the learners revealed that they

were not permitted to use them in the classroom. This was largely due to the teachers being unsure whether smartphones could be used for learning purposes. While some learners saw the smartphone as a distraction, they saw it as a learning tool if used responsibly. The instant availability of the smartphone helped to remember assignment deadlines and that it could be used as a calculator.

Semerci (2018) also conducted a study in Turkey to explore high school learners' views on the use of tablets in education. The findings showed that, before the distribution of tablets, the learners were positive and had high expectations. However, after they began to use the tablets, they were disappointed. Among the reasons cited for this change of attitude were lack of required skills, knowledge and desire about tablets, a lack of coherent policies, strategies and instructions on the effective use of tablets in lessons and inconsistent teaching practices. Another factor that affected learners' attitudes towards tablets was the expectation that had been created before the tablets were distributed that the learners would be freed from carrying books, notebooks and schoolbags. However, after a short period of use, the learners discovered that tablets were not able to meet these expectations and they became frustrated.

However, a study conducted in Uruguay showed a different result. This study followed the implementation of Plan Ceibal (a countrywide One Laptop per Child programme) on reading and mathematical skills. The findings suggested that the programme did not have an impact on reading and maths scores (Melo, Machado & Miranda, 2014). Three crucial findings emerged out of the study. Firstly, teacher training accompanying the programme was optional. Secondly, analysis of descriptive data on the frequency of laptop use during class and the tasks for which computers were used in class, showed that every-day use of laptops in class was not widespread across the schools. Thirdly, laptop use in class was to search for information on the internet. The results of this study highlight Fullan and Langworthy's (2013) assertion that technology cannot have an impact on learning unless there is a transformation of the teaching and learning process. Technology must no longer be seen as a tool to collect information, but rather as a tool, that radically alters the teaching and learning process. Moreover, the role of teachers should no longer be to transmit knowledge but to transfer learning attitudes, support peer learning, and help learners in transforming information into knowledge (Melo, *et al.,* 2014).

3.6 THE ROLE OF SCHOOL MANAGEMENT IN THE USE OF ICTs

The education system globally has to prepare for the looming Fourth Industrial Revolution (4IR) since the job market will be mainly prompted by the advancement of digital economy, robotics, artificial intelligence and automation technology (Thannimalai & Raman, 2018). This challenge requires that school principals and teachers adopt open-mindedness on the

changes and developments brought by technological advances. Furthermore, school management are expected to be at the forefront of all the school improvement changes including those that are technological (Mwawasi, 2014). They carry out this duty in their role as technological leaders. Technological leadership is defined as the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Brown, 2009).

Mwawasi (2014) asserts that among the roles played by management in technological leadership is capacity building. This can be described as the establishment of conditions that would allow individuals within an organisation to engage in the process of learning and adapting to change. With regard to education technology leadership, such conditions include the provision of infrastructure, maintenance of equipment and the training of staff for the integration of ICTs in teaching and learning (Mwawasi, 2014). Therefore, principals need to possess sufficient ICT skills and knowledge in order to guide, motivate and lead initiatives for teachers to integrate technology in the classroom (Thannimalai & Raman, 2018; Mihai & Nieuwenhuis, 2015).

The International Society for Technology in Education (ISTE) is used by many countries as a benchmark for standards a school principal should aim for as a technological leader (Morphew, 2012). The ISTE-compiled National Educational Technology Standards for Administrators (NETS-A) 2009, is a set of standards used around the world in educational institutions of various levels (ISTE, 2009). Under NETS-A, the principal should have five criteria, namely, visionary leadership, digital age learning culture, excellence in professional practice, systematic improvement, and digital citizenship (ISTE, 2009).

3.7 STUDIES ON SCHOOL LEADERSHIP SUPPORTING ICT INTEGRATION

Some researchers have conducted studies to show a relationship between a principal's ICT awareness and integration into teaching and learning. Folashade and Adeniyi (2017) conducted a study in a Nigerian province's secondary schools to investigate if there was a link between principals' personal variables and the use of ICT. The study concluded that the principals' variables of gender, experience and ownership of school could influence their utilisation of ICT in the management of senior secondary schools.

Another study conducted in Kenya by Chepkonga (2015) sought to find out if there was a relationship between ICT training of principals and ICT integration in management of public secondary schools. The findings and the analysis showed that there was a significant relationship between the principals' educational level and ICT integration in the management of public secondary schools in Kenya.

Researchers Thannimalai and Raman (2018) conducted a three-pronged study in the Kedah district in Malaysia. Firstly, the study wanted to identify the level of principals' Technology Leadership with regard to Visionary Leadership, Digital Age Learning Culture, Excellence in Professional Practice, Systemic Improvement, and Digital Citizenship. Secondly, to research the relationship between Principals' Technology Leadership and Teachers' Technology Integration. Thirdly, to research the effect of Professional Development as a moderator on the mentioned relationship.

On the first part of the study, the results indicated that the level of technology leadership amongst Kedah principals was at a high level. The result was in line with a finding by Leong, Chua and Sathiamoorthy (2016) in a study conducted in Negeri Sembilan schools, Malaysia. In this study, the teachers perceived that their principals practised a high level of technology leadership for all five dimensions. This finding demonstrated that principals in Negeri Sembilan secondary schools realised their role, as technology leaders and that they were capable of playing a technology leadership role in their daily practices as observed by their teachers (Leong, *et al.,* 2016).

The study found that principals' technology leadership was a good determinant of teachers' technology integration. This is in line with Fisher and Waller (2013) whose study indicated that strong technology leadership by campus management was positively correlated to teachers' abilities to integrate technology in the classroom successfully.

In addition, when professional development was used as a moderator, the study showed a significant relationship between Principals' Technology Leadership and Teachers' Technology Integration. The implication is that professional development is the overriding factor in facilitating technology integration in the classroom (Leong, *et al.,* 2016).

3.8 FACTORS ENABLING TEACHERS' TECHNOLOGY USE

Information, communication and technology (ICT) in education refers to the utilisation of computer-based communication that embraces technology in daily classroom teaching processes (Ghavifekr & Rosdy 2015). In this setting, teachers are viewed as the crucial players in using ICT in their daily classroom engagements. Teachers need adequate ICT skills to implement the technology and to have the confidence to use it in the classroom. These skills can be acquired through adequate training. Training will help teachers feel confident and competent while using ICT at the right time and opportunity. Moreover, when training provides real-life examples, it will assist trainees to understand the best way and time to utilise ICT in teaching and learning. Furthermore, teachers need insight into the pedagogical role of ICT in

order to utilise it successfully in the teaching and learning process (Cubukcuoglu 2013; Haji, Moluayonge & Park, 2017).

Today, several types of technology are used to support and strengthen the teaching and learning process. Teachers have to surf the internet to collect information for lesson preparation, use applications to prepare presentations, and create digital learning materials for learners. In addition, teachers use ICT to give feedback, assess learning, communicate online with parents, download and upload material from the school's portals or learning management system while also searching for online professional development opportunities (Haji, *et al.* 2017; Uluyol & Sahin, 2016).

Ghavifekr and Rosdy (2015) attest that most subjects, for example, mathematics, science, and languages can be learned more effectively through technology-based tools and equipment. However, the two researchers do not view technology as replacing quality teachers. Instead, technology is an add-on supplement needed to improve the teaching and learning process.

The support that teachers receive from management assists in making the teachers integrate technology in their teaching (Petersen, 2014). It is important that teachers feel appreciated by the school management. Teachers and school leaders should jointly set up clear goals for the integration of ICT project in order to define expectations of the various roles as well as the outcomes.

Motivation is another factor in teachers' use of technology in the classroom. Jenkins and Demaray (2015) describe motivation as the energy that provides the force for human behaviour. Motivation is related to the person's will to embrace a process of action and explains why a person pursues some courses of action but avoids others (Pintrich, 2000). Researchers Uluyol and Sahin (2016) suggest three ways in which educators could be motivated to use technology in their lessons:

- Educators should be encouraged to use technology in the classroom.
- They should be supported when using technology.
- Educators should realise the benefits of using technology themselves.

According to Chigona, Chigona and Davids (2014), motivation can be intrinsic or extrinsic. The former occurs when an individual is internally motivated to do something because it gives him/her either joy, or thinks it is important. Examples of this are achievement, recognition, work, responsibility, advancement and the possibility of growth. Extrinsic motivation takes place when a teacher is compelled to do or act in a particular way because of factors external

to him or her. Examples of extrinsic motivation are policy and administration, technical support, working conditions, and status.

The use of technology has a positive effect on learners (Abdullah, Abidin, Luan, Majid & Atan, 2006). Technology increases learners' motivation for learning and makes them take part in the teaching and learning process without feeling bored as learning is enjoyable.

3.9 FACTORS IMPEDING TECHNOLOGY USE

Uluyol and Sahin (2016) aver that teachers are the factor influencing integration in schools because they decide whether, what and how technology gets used in classrooms. Teachers, therefore decide whether learners can benefit from the use of information technology in a particular learning situation.

Over the years, several action plans have been developed to promote integration in educational programmes. However, many barriers still recur (Goktas, Yildirim & Yildirim, 2009). Ertmer (2009) categorises these barriers into two groups: extrinsic and intrinsic. Extrinsic barriers include a lack of resources, inadequate technical support, lack of time and insufficient training, while intrinsic barriers include teachers' beliefs, attitudes and views about knowledge, learning and teaching. In a study conducted among Indian teachers working in the United Arab Emirates, findings were that, though the teachers had a positive attitude towards the use of ICT in the classroom, lack of competence was a barrier (Bindu, 2017). Teachers who are not skilled in ICT were unable to contribute to ICT integrated learning. This was compounded by lack of proper training offered to teachers to improve their use of ICT as a pedagogical tool. The training given to teachers was general in nature and not offering much in terms of improving their ICT skills (Bindu, 2017).

Lack of sufficient ICT equipment and internet access is one of the main problems that schools, particularly those in rural areas, face. For example, the results of research done in Kenya, show that some schools have one computer only and it is in the office. Another problem is the high learner-computer ratio that exists even in schools with computers (Ghavifekr & Rosdy, 2015).

Other problems include technical difficulties that tend to become a source of frustration for both teachers and learners as they disrupt the teaching and learning process. Lack of technical assistance has the effect of discouraging teachers from using ICT equipment because of fear of equipment failure, as they are not given any help on the issue (Turel & Johnson, 2012). According to Turel and Johnson (2012) virus attack and printer not working are some of the problems that impede the use of ICT in the classroom.

In a study conducted among English teachers in Indonesia, the findings highlighted three major challenges. The schools had insufficient equipment and a low internet connection. This meant that teachers had to share these limited resources which wasted their time as they had to wait for their turn to use ICT. The third challenge was the lack of knowledge and training experience that teachers had. Some teachers had difficulties using ICT and needed to learn more to improve their knowledge and skills (Muslem, Yusuf & Juliana, 2018).

Another barrier that schools have in the implementation of ICT integration is the lack of a school vision (Dzidonu, 2010). Because of the absence of a school vision on ICT, many schools have no guidelines to support the school's curriculum like teaching and learning. According to Garath (2008), a school vision for ICT describes a point in time when ICT systems, electronic materials, teaching and learning methods and curriculum organisation will reach a level where noteworthy learning outcomes will have been achieved.

Linked to the lack of vision in some schools is the cost of implementing ICT integration. In a study conducted in a district in Kenya, most of the respondents in the study agreed that the cost of installing the internet in schools was high. The respondents further felt that investing in ICT infrastructure was an additional cost to their existing strained budgets and that maintaining up-to-date software and programs for electronic activities in school was expensive to sustain (Francis, Ngugi & Kinzi, 2017).

3.10 CONCLUSION

This chapter mainly focused on the role of technology use and integration in teaching and learning. It began with a rationale for the use of computer technology in education. This was followed by an examination of policies of technology use in education in different countries. These countries were Canada; Finland; Malaysia; Kenya and South Africa. The chapter continued with a discussion on the impact of information and communication technologies on learners. The role of school management in the use of ICTs was then considered. The chapter then discussed the use of technology by teachers in the classroom. Factors facilitating technology use in teaching and learning were examined. The chapter closed with a discussion on factors impeding teachers from using ICTs in the classroom.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The previous chapter dealt with the literature that examines some aspects of information and communication technology integration (ICT) in the classroom. This chapter describes, discusses and justifies the research design and methodology used in the study. Focus will be on the description of the research paradigm, the research approach, design and data collection techniques used to create an understanding of management's perceptions of ICT integration in teaching and learning in the township and rural schools in KwaZulu-Natal province. The issues of credibility and trustworthiness, as well as ethical consideration, are also reflected on so that the results can be accepted as worthy contributions for resolving the research issue and for use by other researchers.

The research design and methodology used in this study were aimed at answering the following research questions:

How do school management teams perceive the integration of information and communication technology in the township and rural secondary schools in KwaZulu-Natal?

From this main research question, the following sub-questions will be derived:

- How do principals perceive the integration of information and communication technology at the school?
- How do departmental heads perceive the integration of information and communication technology at the school?
- How can the integration of information and communication technology at the school be improved?

Furthermore, the research approaches that were used to answer the research questions asked above assisted in achieving the aims and objectives of this study which were to:

- Enquire how principals perceived the integration of information and communication technology at the school.

- Explore how the departmental heads perceived the integration of information and communication technology at the school.
- Determine what could be done, based on the literature review and the findings of the empirical study, to improve the integration of information and communication technology at schools.

4.2 RESEARCH PARADIGM

According to McMillan and Schumacher (2010), researchers bring three paradigms to research. They are positivism, interpretivism and critical theory. The positivist paradigm defines a worldview to research that is grounded in scientific methods of investigation. This paradigm contends that humans must be studied in the same way as nature is studied. Scientific knowledge is regarded as fact (Nieuwenhuis, 2007). The research located in this paradigm depends on deductive logic, formulation of hypotheses, testing those hypotheses, offering operational definitions and mathematical equations, calculations, extrapolations and expressions, to arrive at conclusions. In the strict positivist sense, the researcher remains distanced from what s/he is studying so that the findings of the research will depend on the nature of the data rather than on the researcher's preferences, personality, beliefs and values (Kivunja & Kuyini, 2017).

Guba and Lincoln (1994) define a paradigm as a basic set of beliefs or worldview that guides research action or an investigation. Similarly, Denzin and Lincoln (2000) see paradigms as human constructions, which deal with first principles or ultimates revealing where the researcher is coming from in order to construct meaning planted in data. Kivunja and Kuyini (2017) assert that a paradigm constitutes the abstract beliefs and principles that shape how a researcher views the world, and how s/he interprets and acts within that world.

According to Guba and Lincoln (1985), a paradigm consists of four elements, namely, epistemology, ontology, methodology and axiology. In research, epistemology is used to explain how we come to know something and how we know the truth or reality (Kivunja & Kuyini, 2017). Schwandt (1997) describes it as the study of the nature of knowledge and justification. Ontology is concerned with the assumptions we make in order to believe that something makes sense or is real, or the very nature of the social phenomenon we are researching (Scotland 2012). According to Kivunja and Kuyini (2017), ontology assists the researcher to conceptualise the form and nature of reality; and what s/he believes can be known about that reality. It enables the researcher to examine his/her underlying belief system and philosophical assumptions about the nature of being, existence and reality. Methodology is the strategy or plan of action, which lies behind the choice, and use of particular methods

(Crotty 1998). Scotland (2012) avers that methodology is concerned with why, what, from where, when and how data is collected and analysed. Axiology refers to the ethical issues that need to be taken into consideration when planning a research project (Kivunja & Kuyini, 2017). It involves defining, evaluating and understanding concepts of right and wrong behaviour relating to the research (Kivunja & Kuyini, 2017).

Ponelis (2015) asserts that the interpretive paradigm is characterised by a need to understand the world from a subjective viewpoint and endeavours to find an explanation within the frame of reference of the participant rather than the objective observer of the action. It, therefore, allows the participant to raise his/her voice in order to be heard which at the same time provides the researcher with an opportunity to gain insight and in-depth information (Thanh & Thanh, 2015). The researcher makes meaning of the data through his/her own thinking and cognitive processing of data informed by his/her interactions with the participants (Kivunja & Kuyini, 2017). There is the belief that the researcher will construct knowledge socially because of his/her personal experiences of the real-life within the natural environment investigated (Punch, 2005).

In Guba and Lincoln's (1994) view, the ontological location of the critical paradigm is historical realism. Historical realism is the opinion that reality has been moulded by social, political, cultural, economic, ethnic, and gender values. Realities are socially created entities that are under a constant internal influence. There are shared characteristics between critical theory and intepretivism with regard to their focus on studying and understanding society, however, the former places more emphasis on reason as the highest potential human beings have as it is through the reasoning that people are empowered to criticise, challenge and change the nature of society (De Vos, Strydom, Fouche & Delport, 2011).

Martens (2015) identifies the following as some of the elements of research conducted within the critical paradigm:

- It is concerned with power relationships that are set up within social structures.
- There is respect for cultural practices.
- There is an examination of conditions and individuals in a situation, based on social positioning.
- Research is treated as an act of construction rather than discovery.
- It is an application of action research.

According to Kaptelenin (1993), questions emerge when computer use is considered: What is the hierarchical level of human-computer interaction within the structure of the activity? Is computer use consistent with the level of particular activities, with the level of actions, or with

the level of operations? Which tools, apart from computerised tools, are available to the user? What is the formation of social interactions surrounding computer use? What are the objectives of computer use by the user and how are they related to the objectives of other people and the organisation as a whole? (Kaptelinin, 1993).

The study was embedded in the interpretivist paradigm as it sought to understand how school management teams perceived the management of information and communication technology integration in township and rural schools in KwaZulu-Natal. According to Mason (2002), the interpretive approach sees people and their interpretations, perceptions, meanings and understanding, as the main sources of data. Furthermore, Guba and Lincoln (1985) describe the interpretivism paradigm as one whereby the researcher does not aim to predict what people will do, but rather to describe how people make sense of their worlds, and how they make meaning of their particular actions. The purpose will be to develop a greater understanding of how people make sense of contexts in which they live and work. Kuada (2012) concurs with Guba and Lincoln when he states that the interpretive paradigm highlights the need to understand how people define situations in which they are involved and the meanings they derive from their experiences. Furthermore, Kuada (2012) reiterates that this paradigm requires the researchers to perceive their actors as engaged in continuous interpretation, meaning creation and sense-making of events and their contexts. The interpretive paradigm does not generally begin with a theory but it leads to the generation or inductive development of a theory or patterns of meanings (Cresswell, 2007).The study subscribed to the critical approach as it suggested that, township and rural schools could not afford not to integrate technology in teaching and learning as they risked being left behind the technological revolution. Failure to keep in touch with current trends in ICT integration would render these schools unable to produce learners who could cope with the demands of the 21st-century.

In pursuit of the purpose of the study, the subjective views and meanings associated with ICT integration in teaching and learning were of huge importance as they portrayed a picture of social reality about ICT integration. The researcher intended to allow the participants in the study to air their views and interpretations that indicated the realities of ICT integration in township and rural schools in KwaZulu-Natal.

4.3 RESEARCH APPROACH

A research approach is the systematic plan put in place that will result in the initial questions being answered later in the research project (Yin, 2009). McMillan and Schumacher (2010),

refer to methodology as a research strategy that converts epistemological assumptions into guidelines that demonstrate how research is to be conducted.

Kivunja and Kuyini (2017), assert that the type of the research problem prescribes the research methodology that the researcher must use in order to obtain the data necessary to answer the main research questions and the ensuing questions. The research purposes can be attained by using any of the three research approaches (Ivankova, Cresswell & Clark, 2007):

- The quantitative approach is based on positivism, which presumes that scientific explanation is based on universal laws. Its primary goals are to measure the social world objectively, to test hypotheses and to predict and control human behaviour. It focuses on numerical data rather than the views made by research participants.
- The qualitative approach is based on interpretivism and focuses on non-numerical data. It seeks to attain a holistic understanding of social life and the meaning that people attach to everyday life. This paradigm allows participants to give accounts of meaning, experience and/or perceptions.
- The mixed method approach amalgamates both quantitative and qualitative methods to produce a wide-ranging analysis of the investigation. This approach allows the researcher to explain expand on quantitative findings using qualitative data.

The qualitative approach was adopted for the study. According to Nieuwenhuis (2007: 50), “Qualitative research attempts to collect rich descriptive data in respect of a particular phenomenon or context to develop an understanding of what is being observed or studied. It, therefore, focuses on how individuals and groups view and understand the world and construct meaning out of their experiences.” The researcher was interested in the qualitative experiences of SMTs with regard to ICT integration. The nature of the topic was best served by this method. Firstly, the topic required that the researcher looks at settings and people holistically. A school could not be reduced to a variable, but to be viewed as a whole (Taylor & Bogdan, 1984). Furthermore, the school community needs to be studied in the context of its past and the situation in which it found itself (Taylor & Bogdan, 1984). Through interacting with the participants, the researcher got the opportunity to obtain a deep and broad understanding of the SMTs’ perspectives and experiences about ICT integration in teaching and learning in these schools.

4.4 CHOICE OF THE RESEARCH PROBLEM

In this 21st-century, technology has become the knowledge transfer highway to all human beings (Simin & Sani, 2015). Education has not escaped being affected by the influence of technology in teaching and learning. Many countries' education policies are aimed at producing learners who will be able to function in technologically driven 21st-century economy. The choice of the research problem emerged from this modern trend of equipping learners with ICT skills to enhance their learning.

South Africa has had a policy on ICT in education since 2004. While there are no authoritative sources that indicate how far the country's education system has met stipulations of the policy, some provinces, notably Gauteng and the Western Cape, have taken initiatives in ensuring that learners in those provinces are part of the technological revolution.

Being a teacher based in the KwaZulu-Natal province, I have always had an interest in the development of the province and its people. The province has the highest number of learners compared to other provinces. There is a view that schools in the province need to offer the highest quality of education to uplift the province economically.

School management teams (SMT) play a pivotal role in the development of a school. As a result, I was interested in discovering, through this study, how SMTs in the provinces' township and rural schools perceived ICT integration in the classrooms. The study shed light on how far the province had come in implementing technology as a teaching and learning tool.

4.5 ROLE OF THE RESEARCHER

The researcher had many important roles to play. Firstly, the researcher was an instrument of data collection through which data obtained from participants was mediated (Denzin & Lincoln, 2003). Secondly, in attempts to access the thoughts and feelings of the study participants, the researcher needed to be aware that this was not an easy exercise as some matters might be very personal to them. Thirdly, to protect the participants and their data, the researcher needed to be articulate to participants about the mechanisms for safeguarding both participants and the data. Fourthly, the researcher had to develop trust between him/herself and the participants. Fifthly, the researcher had to be aware of his/her personal qualities, which might include biases and assumptions, expectations, experiences that might affect his/her ability to conduct the study. Sixth, in this study, the researcher acted as an observer, not taking part in the study.

4.6 POPULATION AND SAMPLING

According to Welman, Kruger and Mitchell (2005), a population is the object of study consisting of individuals, groups, organisations, human products and events, or the conditions to which they are exposed. It is a full set of cases from which a sample is taken and every element with the same characteristics has the chance to be selected for the sample.

A sample consists of the elements of the population considered for inclusion in the study (De Vos, *et al.,* 2011). The sampling for this study will be purposive. According to Rule and John (2011), purposive sampling is where people selected as research participants are deliberately chosen because of their suitability in advancing the purpose of the research.

The researcher, therefore, requested a list of schools with ICTs from the KwaZulu-Natal Department of Education. From the list of 65 schools, 22 were identified as meeting the criterion. Upon further inquiry, it emerged that only12 of the schools actively used the computer laboratories for teaching and learning. Four schools were then selected to participate in the study. The schools were located within the township and rural areas of the EThekwini Municipality, KwaZulu-Natal.

At each school, the principal, and a departmental head were interviewed. The principal is responsible for the professional management of the school and better placed to provide an overall view of the existing situation. The departmental head is part of the school management team and is largely responsible for curriculum management within the school. The departmental head assisted in providing a broader picture of management's perceptions.

The researcher selected people because of their relevant knowledge, interest and experience about the case. At each school, the principal or deputy, and a departmental head were interviewed. The principal or deputy is responsible for the professional management of the school and better placed to provide an overall view of the existing situation. The departmental head is responsible for the management and leadership of a department within the school.

The study took place in the township and rural secondary schools that fall under the eThekwini Municipality under the jurisdiction of the KwaZulu-Natal Department of Education.

4.7 INSTRUMENTATION AND DATA COLLECTION TECHNIQUES

Three data collection techniques were used, namely, semi-structured interviews with a purposely-selected sample of school principals, and departmental heads, non-participant observation, and document analysis on ICT in teaching and learning.

In-depth interviews investigated individual experiences, beliefs and behaviour related to the phenomenon under investigation. According to Kuada (2012), the qualitative interview seeks to gain an insight into the lived experiences of the people one is interviewing. Furthermore, it provides the researcher with the opportunity to listen to what the subjects themselves say about issues that are being investigated in their own words. A popular qualitative interviewing technique that was useful in this study was the *critical incident technique.* It allowed the people being interviewed to freely describe their experiences and to unreservedly express their feelings, and to reflect on their experiences while they were talking to the researcher (Kuada, 2012). In this way, the researcher and the participants were able to explore new dimensions in the investigation.

The advantages of using interviews were that they generated a large amount of data. They allowed the researcher to enter the world of the participants in the process of trying to gain an understanding of their experiences (Robson, 2011) and the researcher was also able to probe for clarity and depth during the interview.

The interviews with the principals and departmental heads were conducted on a one-on-one basis using the same set of questions. It meant that each participant was interviewed on his/her own to allow free expression. Interviews were conducted after school hours to avoid disrupting the teaching and learning programme. To capture the interviews, audio recording equipment in the form of a voice recorder was utilised. Each interview was approximately 30 minutes long as the researcher believed this gave sufficient time for each participant to express him/herself adequately.

The second data-collecting tool used was non-participant observation. This is a research technique whereby the researcher immerses him/herself in a research setting so that they can experience and observe at first hand a spectrum of dimensions in and of that setting (Mason, 2018). For this study, a non-participative observation was used before, during and after the interviews had been conducted. The focus of the observation was on the physical characteristics of the computer laboratories, how ICT were used and the conduct of the participants during lessons. Non-participant observation helped supplement the information obtained from the participants about the use of ICT in schools.

The third data collection tool was document review. Warren and Kanner (2015) assert that documents published by local and national government bodies can be used for qualitative research. Therefore, the researcher used official documents such as White Papers, government reports and policy documents to seek wider understanding of ICT in education.

Newspaper articles and the internet were also consulted, though to a lesser extent to obtain a broader view of the research problem.

4.8 DATA ANALYSIS AND INTERPRETATION

Babbie (2017) describes qualitative data analysis as an approach to making sense of social observations without changing data to a numerical format. Therefore, the researcher commenced by listening to the recorded interviews several times. In the process of listening to the interviews, patterns and themes began to emerge which facilitated coding of the data. Coding is a form of analysis that involves how the researcher differentiates and combines the data retrieved from participants and reflections he/she has made about such information (Babbie, 2017).

During the process of analysis, the researcher used inductive analysis in the empirical study as well as deductive data analysis. These helped the researcher to triangulate the findings by using the categories and themes that emerge through inductive analysis to test, compare and clarify the findings (Mukhari, 2016).

4.9 TRUSTWORTHINESS IN DATA COLLECTION AND ANALYSIS

Trustworthiness was crucial in qualitative research. As a result, it was incumbent upon the researcher to ensure that the research findings were credible and trustworthy so that they could be used confidently by other parties such as researchers and institutions.

4.9.1 Credibility

Shenton (2004) defines credibility as the researcher's attempt to show that a true picture of the phenomenon under scrutiny is being presented. First, in this study, well-established research methods were adopted. For example, the line of questioning in the data gathering sessions and the methods of data analysis were derived from studies that had been successfully utilised in previous comparative studies (Shenton, 2004). Second, triangulation was used by involving a wide range of informants. Most importantly, the viewpoints of individuals and experiences were proved against others so that a rich picture of the attitudes needs or behaviour of those under scrutiny could be constructed based on the contributions of a range of people (Shenton, 2004). Third, steps to help ensure honesty in participants when contributing data were employed. Furthermore, each person approached was allowed to refuse to take part in the project to ensure that the data collection sessions involve only those who were genuinely willing to take part and were prepared to offer data freely (Shenton, 2003). Informants were encouraged to be frank from the beginning of each session, with the researcher aiming to establish a rapport in the opening moments and indicating that there

were no right answers to the questions that are asked. Fourth, member checking was employed. This process involved checking the accuracy of the information captured with the participants themselves. Informants were asked to read any transcripts of dialogues in which they participated (Shenton, 2004). Fifth, before the commencement of the interviewing process, the researcher paid a preliminary visit to the sites. The purpose of the visits was to create the right atmosphere and develop familiarity with the participants while forging a relationship of trust.

4.9.1.1 Utilisation of well-established research methods

In terms of investigating school management teams' perceptions of ICT integration in the township and rural secondary schools in KZN, with regard to credibility, the researcher ensured that the literature study, the interview protocol and document analysis' processes used well-established research methods. For the interviews, the researcher adhered to protocol and asked both principals and departmental heads the same questions.

4.9.1.2 Purposive sampling of participants

The researcher used the purposive sampling method, targeting principals and departmental heads whose schools have ICT infrastructure that was in use, to take part in the study. It was important to capture the lived experiences of every participant as this provided rich information. Furthermore, the researcher believes that the data supplied by the principals and the departmental heads were relevant and suitable in answering the research questions.

4.9.1.3 Preliminary visits

In order to facilitate a relaxed ambience and promote familiarity with the participants, the researcher paid each participating school two pre-interview visits. This was crucial to establish a relationship of trust with the principals and departmental heads. These visits also allowed the researcher to briefly explain to the participants the researcher's intentions about the study. The researcher's data gathering processes were fully explained to further assure the participants and to confirm their willingness to participate in the study.

4.9.1.4 Pilot testing

A pilot test was conducted before the actual research took place. It was about testing on a small scale how something would work (*Oxford School Dictionary and Theasaurus,* 2007). This process allowed the researcher to identify elements of the model, which needed

modification. The interview questions were tested to ensure that they did not confuse the participants. Furthermore, they ensured that the researcher's study goals were met.

To meet credibility and trustworthiness requirements, the researcher piloted the interim questions with one principal and one departmental head to ensure the clarity and order of the questions. This process allowed the researcher to eliminate questions that were already answered, and helped to streamline the interview process.

4.9.1.5 Member checking

Koelsch (2013) describes member checking as the process where the informant is given the relevant sections of a research report and is asked to comment on the accuracy of the report. Ordinarily, the focus is on the content of the participant's experiences, emotions and thoughts. Lincoln and Guba (1985) regard member checking as an ideal means of assessing the validity of a qualitative study since the first step of many qualitative undertakings is to accurately understand the participant's worldview.

After the transcriptions of the interview data had been made, the researcher handed them back to the participants to check if the researcher had clearly and accurately captured their experiences and perceptions. In essence, the purpose was for the participants to check whether the researcher captured true and authentic representations of what they had said during the interviews. Participants were informed that they could alter the transcripts if there was a need to do so. Having been given the said opportunity, all the participants confirmed that the information in the transcripts was a true reflection of what they had said during the interviews.

4.9.1.6 Triangulation

De Vos *et al.* (2011) aver that triangulation is a research approach that uses a mixture of more than one research strategy in a single study in order to strengthen confidence in the subsequent findings. In this study the researcher used triangulation since more than one data gathering method was used. Data gathering used the following strategies: semi-structured interviews, non-participant observation, and document review. These techniques allowed the researcher firstly, to add depth to the enquiry and secondly, to cross-check in order to boost credibility and validity in the research findings.

4.9.2 Transferability

Lincoln and Guba (1985) describe transferability as the provision of enough detail of the context of the fieldwork for a reader to be able to decide whether the prevailing environment is similar to another situation with which he or she is familiar and whether the findings can justifiably be applied to another setting. To ensure transferability, thick descriptions were used. This refers to the detailed account of field experiences in which the researcher makes explicit the patterns of cultural and social relationships and put them in contexts (Holloway, 1997).

The population of this study were township and rural secondary schools that used ICTs for teaching and learning. It should be noted that the researcher could not research in all the schools that met the criteria. Therefore, a sample of the schools was purposively selected. As a result, the research findings were transferable to the principals and departmental heads of schools that are integrating ICTs in their schools.

4.9.3 Dependability

To address dependability, the processes within the study were reported in detail. This would enable a future researcher to repeat the work if not necessarily to get the same result. Furthermore, this in-depth coverage allows the reader to assess the extent to which proper research practices had been followed.

According to Shenton (2004), a study has three sections devoted to it:

- The research design and its implementation, describing what was planned and executed on a strategic level;
- The operational detail of data gathering, addressing the small details of what was done in the field; and
- Reflective appraisal of the project, evaluating the effectiveness of the process of inquiry undertaken.

In this study, the dependability criterion was met by sending a summary of the findings to the KwaZulu-Natal Department of Education head office. The report also contained suggestions for future research in ICT integration in the province.

4.9.4 Confirmability

Confirmability is the researcher's taking of steps to demonstrate that findings that emerge were from the data and not his/her own (Shenton, 2004). To this end, beliefs underpinning decisions made and methods adopted were acknowledged within the research report, the reasons for favouring one approach when others could have been taken were explained and

weaknesses in the techniques employed admitted. Triangulation, which is examining the consistency of different data sources from within the same method, was used in this study.

In this study, the research findings were confirmed by referring to the literature review information in Chapter 3. Furthermore, confirmability was applied through ensuring that the findings ensued from the experiences and opinions of principals and departmental heads who took part in the study as opposed to the views of the researcher.

4.10 RESEARCH ETHICS

In terms of ethics, the researcher must respect the autonomy of all the people participating in the research (Blanche, Durrheim & Painter, 1999). The principals and departmental heads of the sampled secondary schools were informed that information obtained from the research participants would not be revealed to any organisation, person or any other source. They were assured that their names and the names of their schools were anonymous and only pseudonyms were to be used. In addition, the participants were asked to respect the confidentiality of the other participants. The research participants were not coerced into participating in the research but participated freely and this was emphasised in the permission letters. The letters indicated dates, time and venues of the interviews. Informed consent was obtained from the participants before the commencement of the interviews to ensure they understood the possible consequences of their participation. Participants had a right to withdraw at any time of the study and they were informed that there would be no consequences for doing so. Participants were granted an opportunity to read the transcripts of the interviews to ensure they related to what was said during the interviewing sessions. This ensured openness and justice to the participants.

The other principle that was observed was the principle of non-maleficence. Blanche *et al.* (1999) point out that the researcher should do no harm either physical, emotional or other harm to any participant. Therefore, in the study, the researcher endeavoured to work within the parameters of the research problem and not harm the participants. Furthermore, the principle of beneficence was observed. This research was of social benefit even though the participants did not directly benefit from participating. The participants were informed about the value of the study.

4.10.1 Ethical clearance and permission

Prior to embarking on the empirical study, the researcher obtained ethical clearance from the College of Education at the University of South Africa where the researcher is a student. The researcher also applied for permission to conduct the study at the KwaZulu-Natal Department

of Education schools. This permission was obtained from the office of the Head of Department –KwaZulu-Natal Department of Education.

4.10.2 Informed consent

In social research, informed consent consists of three elements. These are:

- Fundamental sufficient information (participants are given sufficient information about what they are consenting to).
- Voluntariness (participants are conscious that they are under no compulsion to take part, and have the full right to withdraw at any stage),
- Competence (participants are able to understand what consent will involve and when making the decision as to whether or not they wish to take part (Beauchamp & Childress, 2001).

Informed written consent is considered a fundamental condition in a research study. The researcher needs to emphasise accurate and complete information so that the participants fully understand the details of the investigation and subsequently are in a position to make an informed decision about their participation (Mukhari, 2016).

The participants signed a written consent form, which indicated their understanding of the project and their consent to voluntary participation.

4.10.3 Confidentiality and Anonymity

Confidentiality and anonymity mean that the setting and the participants should not be identifiable when reporting the findings (McMillan & Schumacher, 2006). The researcher promised the participants that all the information they provided was confidential and their identities would remain anonymous. Participants were informed that they had the right to refuse to be recorded. In such a case, the researcher used a pen and paper to capture the participants' responses. The names of the schools involved were kept confidential to protect their identities.

4.11 CONCLUSION

This chapter described, discussed and justified the research design and methodology used in the study. The focus was on the description of the research paradigm, the approach, design and data collection techniques used to create a deep understanding of management's perceptions of ICT integration in teaching and learning in the township and rural schools in KwaZulu-Natal province schools. The issues of credibility and trustworthiness, as well as

ethical consideration, were also reflected on so that the results can be accepted as worthy contributions for resolving the research issue and for use by other researchers.

CHAPTER 5

DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF FINDINGS

5.1 INTRODUCTION

The previous chapter highlighted the significance of the qualitative research design and the use of the case study in particular for this research project. This chapter is made of two sections, namely, data analysis and the discussion of findings. The first section deals with the analysis of data and the discussion of the empirical findings. The second section deals with the evaluation and a discussion of various documents on ICT integration in teaching and learning. The first aspect of the empirical findings focus on brief profiles of the participating schools. The findings are presented and augmented by participants' quotations to answer the research questions outlined in Chapter 1. The theoretical framework in Chapter 2 and the literature review in Chapter 3 supplied the foundation that supported the explanations of the data collected as documented in Chapter 5 and the recommendations in Chapter 6 to ensure that the research findings were supported by and anchored on the literature (Mukhari, 2016).

5.2 DATA ANALYSIS

Data analysis is a systematic process whereby the researcher attempts to make sense of the collected data. It is not an isolated process but goes hand in hand with other parts of developing the qualitative study, namely, data collection and the writing of the findings (Cresswell, 2014). This process starts with the gathering of data and lasts until the data have been assessed. As a result, data collection and analysis are intertwined and influence one another. This is avered by Cresswell (2014) who asserts that, unlike in quantitative research where data analysis is a linear process, in qualitative research, it is a cyclic procedure that consists of two processes that go hand in hand to create a logical interpretation of the data.

The researcher used a voice recorder to capture the participants' responses. After collecting the empirical data, the researcher began by transcribing verbatim the recorded interviews. The resulting transcripts were returned to the participants to check on their veracity. This was meant to ensure that what was transcribed was what the participants wanted to say. The above process formed part of member-checking which ensured the credibility and trustworthiness of the study (Babbie, 2016).

The researcher subsequently read the transcripts several times to gain an in-depth understanding of the views of the principals and departmental heads that were interviewed. This also served to enable the researcher to begin the coding and thematic analysis of the

data. The coding process involved the researcher identifying texts that formed meaningful pieces, which were to be used as units of analysis. The researcher used colour-coding to separate the different categories. The codes enabled the researcher to identify emerging themes and label them in accordance with the research aims of the study. In due course, the researcher clustered similar interview questions and responses which indicated similar views to make it easier to organise the data. The researcher then blended the responses and interpreted the participants' perceptions of ICT integration in teaching and learning at their schools.

The following section provides a brief background of each participating school. The researcher changed the school names to protect their identities.

5.3. BRIEF BACKGROUND OF EACH PARTICIPATING SCHOOL

For a sample of the participants, the researcher requested a list of schools with ICTs from the KwaZulu-Natal Department of Education. From the list of 65 schools, 22 were identified as meeting the criterion. Upon further inquiry, it emerged that only12 of the schools actively used the computer laboratories for teaching and learning. Four schools were then selected to participate in the study. At each school, the principal and a departmental head were interviewed. In total, the researcher conducted eight interviews. The principal is responsible for the professional management of the school and better placed to provide an overall view of the existing situation. The departmental head is part of the school management team and is largely responsible for curriculum management within the school. The departmental head assisted in providing a broader picture of management's perceptions. The schools were allocated pseudonyms to hide their identities. These were Sun High, Neptune High, Saturn Secondary and Mercury High.

5.3.1 Sun High

This is a rural-based boarding school near Durban. Based on the government's socio-economic profile, the school falls under Quintile 2, making it a "no fee" school. However, learners pay for boarding and lodging. The school has an enrolment of 800 learners. It has a classroom-size computer laboratory with 30 desktop computers. There are also 50 tablets, which are connected through a server that can be used by teachers and learners in classrooms throughout the school. Learners are allowed to use cell phones in some cases for learning purposes. The school has an internet connection.

The principal and the departmental head confirmed that ICTs were used at the school for teaching and learning purposes. However, the main focus was on Mathematics and Physical

Sciences. At the time of the interviews, none of the remaining subjects were taught through ICTs. This is what the departmental head said

I can say we have two parts of ICT that we use at our school. We have tablets that we use inside the classroom. We also have computers where learners get to go to the computer lab. *With the tablets, the teacher has access to a wide variety of information to choose from. Inside the tablets, there is a variety of teaching sources. There are textbooks and videos that learners get to watch.*

5.3.2 Neptune Secondary

The school is located in a rural area in KwaZulu-Natal. It is a "no-fee" school with over 1100 learners. It has one computer laboratory with 25 desktop computers. The school has 50 tablets that learners can use during teaching and learning. Some classrooms have overhead projectors while two have smartboards. Permission to use cell phones is given to learners if there is a need. The school has an internet connection.

The principal stated that teachers used ICTs during lesson preparation and teaching. The school has software that caters for all subjects offered at the school. In his words:

These tablets contain material for all subjects where each and every educator is catered for starting from the languages and any other subject is contained in these software.

5.3.3 Saturn Secondary

This is a township based school situated north of Durban. It is a "no-fee" school with over 1300 learners. The school has two computer laboratories. One contains 30 desktop computers while the other has an overhead projector. This room allows learners to use the school's 50 tablets. There is an internet connection available.

At Saturn Secondary, ICTs are also used by teachers in the classroom, according to the principal:

Teachers use ICTs as a teaching resource in the teaching of Information Technology (IT) and Computer Applications Technology (CAT) as our school offers the subjects. Also, educators use ICTs in delivering lessons as teaching aids. Our school has smartboards*, laptops and projectors.*

The departmental head further confirmed what the principal had said. In his words:

At our school here, some lessons are recorded and shared with learners to use at home when studying. Also, some teachers project notes on the whiteboard as opposed to using chalk and the board. Other lessons are delivered through videos from the internet to explain concepts as opposed to the teacher explaining concepts themselves.

5.3.4 Mercury High

The school is situated in a rural village about 30 km west of Durban. It is a “no-fee” school with about 1200 learners. There are two computer laboratories at Mercury. One contains 30 desktop computers while the other has a capacity to sit 40 learners using the school's 50 tablets. While learners are not allowed to bring cell phones to the school, the rule is relaxed in some cases, on request, should a lesson demand their use. The school has an internet connection, which is sponsored by one of the country’s major cellular network providers.

In the words of the school principal, at the time of the interview, cell phones were the instrument used by teachers and learners:

For now, most of the instruments being used for that purpose are the cell phones because there are programmes that have been installed in cell phones that can be accessed by the learners.

The departmental head confirmed the use of ICT at the school but felt their use was biased towards Mathematics and Physical Sciences:

Yes, technology is being used at our school. But I think Mathematics and Science learners are the ones who benefit the most as the ICT equipment we have is largely geared towards those subjects and they receive a lot of support.

5.4 PRESENTATION OF EMPIRICAL FINDINGS

This section presents the findings of the data collected from the interviews with principals of the selected township and rural secondary schools in KwaZulu-Natal. The interviews aimed to investigate perceptions of the principals about ICT integration at their schools.

The main research question was: **How do school management teams perceive the integration of information and communication technology in the township and rural secondary schools in KwaZulu-Natal?**

The following were the sub-questions:

- How do principals perceive the integration of information and communication technology at the schools?
- How do departmental heads perceive the integration of information and communication technology at the schools?
- How can the integration of information and communication technology be improved?

5.4.1 Themes emerging from principals' and departmental heads' interviews

The analysis of the interview data is based on the statements of the principals and the departmental heads. The study indicates that the management's perceptions of integration of ICTs into teaching and learning at the selected schools are characterised by factors that emerged as themes during the coding and theme analysis procedure. These themes were then synthesised and nine important themes that emerged based on the researcher's observations are highlighted as follows:

- Challenges concerning ICT infrastructure
- Inadequate ICT training
- Poor security
- Lack of clear direction (vision) for use of ICTs
- Outdated school rules
- Benefits of ICT use
- Funding barrier
- Support from the school principals
- Replacing textbooks with ICTs

5.4.1.1 THEME 1: Challenges concerning ICT infrastructure

The principals and the departmental heads interviewed showed appreciation that their schools have ICT equipment. As stated earlier in the chapter, these ICTs include desktop computers, tablets, television sets, smart boards and overhead projectors. However, continued discussions showed that there was a realisation that these were not enough to cater for the wider school community, which includes teachers and learners.

The researcher will now proceed to sub-divide the theme into 5 noticeable sub-themes. These are inadequate computers; software; lack of funds to buy computers, internet connection; and power supply.

5.4.1.1.1 Sub-theme: Inadequate computers

In most of the schools, there were two computer labs which could at most accommodate no more than 60 learners at a time. Enrolment figures at the schools ranged between 800 and 1300 learners. This means that ICTs are not available to all learners at the same time. As the Mercury High departmental head attested:

It is a challenge to use the computers, though, as not all classrooms have them.

To further highlight the difficulties caused by inadequate computers the departmental head added:

Right now we all have to share the two computer labs and the queue to gain access can be long.

The statement confirms one of the findings by Muslem *et al*. (2018) in a study conducted among English teachers in Indonesia. The finding was that where schools had insufficient equipment, teachers had to share these limited resources which wasted them time as they had to wait for their turn to use ICT.

To this researcher, the above statements by the Mercury departmental head reinforce the notion that lack of enough ICTs poses a serious challenge to educators and may even discourage them from wanting to use ICTs. Having said that, this researcher believes that it is the responsibility of school management to find solutions to these challenges as they are seemingly going to last well into the future. One of the solutions could be to devise a negotiated timetable for laboratory use. This would prevent a situation where one teacher is selfishly using the lab at the expense of other teachers even for tasks that can be better performed outside the laboratory.

5.4.1.1.2 Sub-theme: Software

In two of the secondary schools, only Mathematics and Physical Sciences were the subjects catered for in terms of available software. The reason for this is that the tablets were donations from private sector companies whose main goal was to see an improvement in outcomes in the teaching and learning of the two subjects. As confirmation of the donation, the principal of Sun High opined:

We are having the honour of having tablets that were given to us by Siyafunda. The aim of Siyafunda is to upgrade the teaching and learning of Maths and Science subjects.

The Neptune High departmental head also attested:

We do use ICTs at our school. Some of the tablets have been supplied by Siyafunda, which is an NGO dealing with the teaching of Maths and Science.

This researcher observed two points here. Firstly, in these two secondary schools, the ICTs available came from private companies. They were not supplied by the state. Secondly, not all subjects are taught using ICTs. The researcher believes that software is not as expensive as hardware. As the Saturn Secondary principal confirmed, this is a challenge that can be overcome:

If ever educators indicate to me that there is software that they need to have installed at the school, I take it as my responsibility to make sure that this is provided within the school.

The above statement by the principal indicates that with proactive leadership some of the ICT challenges can be overcome. This researcher thinks that the time has come for schools to use the resources provided by the government to promote and improve the provision and use of ICTs within their schools. This can only take place when there is bold and visionary leadership among school governing bodies during the budgeting process, coupled with school management that is not shy to push the ICT agenda within their schools.

5.4.1.1.3 Sub-theme: Lack of funds to buy computers

Township and rural secondary schools do not have the financial muscle to purchase computer equipment on their own. This can be attributed to an inadequate budget from the state. A school such as Saturn Secondary, a “no fee school”, reliant entirely on government funding, and offering subjects such as Information Technology (IT) and also Computer Applications Technology (CAT), has an even bigger problem. According to the principal, this situation reduces the number of learners who can benefit optimally through the use of ICTs. This was highlighted by the principal with these words:

Lack of sufficient funds is a huge challenge as these are technology subjects and technology changes now and again.

This researcher concurs with this statement since the ever-changing nature of technology and the costs involved are often ignored whenever a case for ICTs in education is made. The principal also lamented the lack of support from the parent community when it came to purchasing laptops for their children. While the principal’s sentiment about lack of parental backing is understandable, the socioeconomic conditions that generally prevail in the communities where these schools are situated cannot be ignored. While this researcher does not want to appear as promoting parental neglect of children, the unemployment situation in these communities is severe and this results in some parents being more concerned with survival with the money they may be having than prioritising an electronic gadget, useful as it may be to a child.

The current economic scenario facing the current government points to a period of reduced budgets, which dashes any hope of more money being available. It does not help that the country is facing credit rating downgrades that will severely curtail its ability to source finance from international banking institutions. In this situation, I would encourage principals to source help from non-governmental organisations (NGOs) and the private sector. The Neptune principal testified that it can be done. In his words:

I used to go out to access funding to ensure that the computers that we have are up to standard and the software that we have is not outdated.

The Mercury High principal also shared his experience when saying:

We have tried to bring in the corporate sector to build us a computer lab. Right now we are working with Vodacom. Vodacom has been able to be of great assistance to us. They have revamped our original computer lab so that it can be able to accommodate sixty learners at one go. They have also provided us with sixty laptops and the other things that go with ICT, including connection to the internet.

Therefore, principals need to appreciate that there are several entities outside the government willing to assist in the provision of education.

5.4.1.1.4 Sub-theme: Internet connection

It is generally accepted that having ICTs without any form of internet connection result in less than optimal use of the equipment. The world has become a place where data is required to stay connected.

The participating schools have different experiences about internet connection. These experiences were shared by departmental heads. The first response to highlight came from Mercury High. At her school internet access is only possible when in the computer lab. Since access to the lab is difficult due to prior booking that needs to be made, she relies on learners' cell phones to access the internet during some lessons. This requires the purchasing of data to load into learners' cell phones. This is what she said:

Personally, I prefer that learners use cell phones as it is more convenient. So to overcome data issues I sometimes ask learners to club their resources to buy data as it is only available at the computer lab.

The Sun High departmental head also shared his experiences:

…to access this thing you need WiFi and it is not really accessible. For our school, we have a small server box, which we have to take to each class.

The Saturn Secondary departmental head commented about the weak internet connection existing at her school:

Our infrastructure is outdated and unreliable so performing updates on the machines is difficult due to poor internet connection.

The above testimonies point to challenges schools that have adopted ICTs are facing. It is telling that they are coming from departmental heads who are closer to classroom teaching activities than principals. They experience the effects of the challenges first-hand since they are teachers themselves. This researcher believes that, though principals are seen as

instructional leaders in schools, departmental heads should be brought closer to the decision-making process to ensure informed seeking of solutions.

5.4.1.1.5 Sub-theme: Power supply

The availability of electricity has always been taken for granted in this country, at least in urban areas. But this has not always been the case with the township and rural areas. The Saturn Secondary departmental head shared her experience on the matter:

ICT use relies on a stable power supply. This is a problem because the school is based in an area where unexpected power outages are common. This forces us to completely change lessons.

The above scenario poses a dilemma for teachers wishing to use technology. A teacher plans a lesson where technology is to be used, not knowing there will be no power supply when the lesson is due. Currently, the country is experiencing rolling blackouts, which are set to continue well into the future. To be precise, energy experts are predicting up to 10-hour electricity outages in the near future (Naik, 2020). This is going to negatively affect the use of ICTs at schools. Furthermore, it will deny a significant number of learners the opportunity of preparing for the future through learning using technology. While wealthy schools can resort to generators and/or even solar power to keep their operations going, this is not possible for "no fee" schools relying entirely on government funding for their sustenance. The solution is ultimately on the government sorting out the electricity crisis to ensure an uninterrupted supply.

In conclusion, this theme demonstrates that the selected schools have significant infrastructural shortcomings. The first one is the small number of computers available in the laboratories, which makes it impossible for a bigger number of learners to use computers at the same time. This practically reduces the number of periods in which learners can access the library. Software is another problem that results in fewer subjects being taught using computers. In most of the schools visited, only Mathematics and Life Sciences had the necessary software. What also emerges from this theme is that the shortage of computer hardware cannot be mitigated due to the shortage of funds within the schools. Those schools wanting to buy computer hardware on their own are constrained by a combination of strict government budgetary controls and apathetic parents. Furthermore, the schools do not have a reliable internet connection. In some schools, connection is only possible when in the computer laboratory. One teacher, subsequently, prefers to use learners' cell phones for online access, instead of the computer laboratory. Lastly, the theme shows that electricity supply shortages prevent schools from optimally using technology. The country's current

power supply problems are even forcing some teachers to revert to outgoing teaching methods, as they are less reliant on electricity that teaching using technology.

5.4.1.2 THEME 2: Inadequate ICT training

Interviews with the school principals in the selected schools indicated that they individually understand and appreciate the need for teachers to undergo training in the use of ICTs if integration was to be effective. This is what the Neptune High principal said:

I make sure that most of them become literate when it comes to ICT use. Secondly, I encourage them to have love for the use of ICT because, nowadays there is no other method since we are changing into another century, so we need to promote that. So, I am encouraging them to attend ICT workshops that are organised by the Department of Education and those educators that are well versed in the use of ICT I am taking them as the lead teachers so that they can pass on their knowledge to the less skilled educators.

The next comment by the Neptune High principal indicates that he has taken a proactive approach in promoting ICT integration:

I also encourage educators to visit the centre where this provision (lab) is made so that even those that are not used to technology, if they see others doing that they will be encouraged to use ICTs in terms of their teaching.

The Mercury High principal reiterated the second point made by the Neptune High principal:

We have also invited all the teachers to the computer lab and have shown them the kind of teaching material that is in the server that can be used by various subject teachers towards teaching the learners.

The Sun High and the Saturn Secondary principals further confirmed the researcher's opening statement with the following respective quotations:

Even the teachers themselves need to be exposed to technology as information these days is mainly contained in these gadgets. In fact, the department of education is in the process of upskilling teachers in the use of these gadgets as there is a division that specialises in training in the use of these gadgets and we are invited to be accustomed to their use.

I think that firstly, each and every educator must be computer literate.

The statements by the principals above show open-mindedness on their part on the changes and developments brought by technological advancement. They seem to be at the forefront of improvement at their schools with regard to ICT integration (Mwawasi, 2014). While the

principals were not required to disclose if they possessed sufficient ICT skills, their statements suggested that they were able to guide, motivate and lead initiatives for teachers to integrate technology in the classroom. According to Thinnimalai and Raman (2018), principals as technological leaders at their schools need to have those skills.

It is also encouraging that though the provincial education department has not supplied any ICT equipment to the participating schools, it has seen the need to train teachers in the use of ICTs. The one drawback to the department's exercise is that the training is not compulsory yet. To the researcher, it is an indication that the department does not yet have a comprehensive and implementable plan to introduce ICT integration at the schools they administer. While the issue of funding is often cited as the main reason why there has not been a rollout of ICTs to government schools in KwaZulu-Natal, the reality is that the provincial schools are being left behind the technological revolution other provinces such as Gauteng and Western Cape have already embarked upon. This is going to have a negative impact on learners who attend schools in this province when in competition with learners who come from the two provinces mentioned.

Interviews with departmental heads indicated that, while efforts to promote the use of ICTs were being made by school principals, as they testified during their turn, there were still some areas of concern in as far as the training of teachers was concerned. The researcher opines that lack of formal and compulsory ICT teacher training can result in an unbalanced staff in terms of the required skills. There may be staff members who are adept in ICT skills while others are not. This is reflected in the words of the Neptune High departmental head:

At the moment these gadgets have just come. Not everyone has access to them. Even myself, I'm not sure if I can use them. The only thing we are expecting from the people who supplied the gadgets is for them to teach us, to workshop us on the use of the gadgets.

The above statement also highlights some of the problems encountered by recipients of aid. Companies supply equipment to communities but do not support those initiatives through training on their use and even maintenance. In some instances, the equipment remains unused until it becomes obsolete. It would, therefore, be worthwhile for companies to thoroughly think through their efforts when making donations so that recipients can acquire the maximum benefit.

The researcher has noted that, in general, when the issue of ICT training for teachers is mentioned, there is usually an assumption that learners already know how to use ICTs. There is never a consideration that learners too need to acquire computer skills in order to be able

to use the ICTs. In the four schools I visited, Sun High has recognised this oversight by running a programme to teach learner computer skills. This is what the departmental head said:

With the computer lab we have a teacher who does computer literacy with the learners. At the moment she is teaching Grades 8 and 9. What she does is she teaches basics of computer use, your Microsoft excel, the hardware, different parts, etc.

To highlight the fact that the lessons do not form part of the program of studies, he said:

So it is just the learners learning getting to know the programmes and how computers are used. We are not really going to the extent of assessing. We are not giving results as computers are not part of our curriculum.

The above is a commendable effort on the part of the school as not all learners have had access to computers and acquired skills that would allow them to navigate the internet, for example. Hattie (2013) avers that classroom use of technology can be successful if pre-training in the use of computers as a teaching and learning tool has taken place. Furthermore, the European Commission advocates that learners be digitally literate for learning to be successful. Digital literacy is confident and critical use of ICTs for activities such as work, learning and communication. The researcher noted during lesson observation that some teachers had to stop their lessons and spend valuable teaching time to help learners who were struggling to find the sites they had referred learners to. This can be avoided if learners have basic ICT skills such as how to open a computer or tablet, and how to search for information on the internet.

In conclusion, principals recognised the need for training in the use of ICTs. They took an active stance towards training by encouraging teachers to attend workshops on ICTs, organised by the department of education. But, there was concern that the training provided was not compulsory. This resulted in a school having teachers with the necessary training, while others do not.

It also emerged that training for learners tended to be neglected probably based on the assumption that today's young people were adept at technology. However, one school had taken the initiative to train learners in the basics of computer use to ensure learners were on the same platform in terms of computer competency.

5.4.1.3 THEME 3: Poor security

It is generally accepted that the country is experiencing high levels of crime today. This has impacted on all sectors of society. Schools are no exceptions. Crime affects communities and

schools operate within them. The Neptune High principal highlighted how the scourge of crime affects schools like his when saying:

… there is lot of burglaries that are affecting schools with ICTs. If criminals see or hear that there is some ICT equipment brought to the school, that school will be targeted and the equipment would be stolen.

Based on this statement, it is clear that crime has a negative effect on teaching and learning through ICTs. It may deter some schools from even moving towards ICT integration if there is fear that equipment might be stolen. It may be easy to call for security for schools with ICT equipment but that on its own may not be enough. In 2019, two security guards were killed and one was seriously injured in a night attack at a secondary school in Mpumalanga township, near Hammarsdale, KwaZulu-Natal (Singh, 2019). A few weeks before, computer equipment worth thousands of rand had been delivered at the school as part of its move towards ICT integration. In another well-publicised case, thieves stole three million rand worth of computer equipment at a primary school in Soweto. During the incident, computers and smart boards meant for learners were taken (Dlulane, 2019). In the same article Gauteng education MEC, Panyaza Lesufi revealed that in 2019 alone, one hundred and twenty million rand worth school equipment, mainly ICTs, was stolen from some of Gauteng's 256 schools.

The above incidents indicate the gravity of the crime situation facing schools with ICTs. It is a national concern that requires a number of stakeholders to rectify. The researcher believes that it requires schools, communities, and law enforcement agencies to work closely to curb this criminality. Not only does it deny the most vulnerable sectors of society from empowering themselves through 21st-century education and opportunities, but it also leads to the loss of innocent lives. A school is a community resource and it is incumbent upon communities to protect it. This is crucial as criminals reside within communities and they are known.

Some schools using ICTs mentioned that they allow learners to use cell phones for classroom-related matters. However, the Neptune High principal gave a reason why his school discourages learners from bringing cell phones to school:

…if ever a learner brings a cell phone, there is a tendency of other learners to call hooligans from outside the school to indicate that so and so is carrying what kind of a cell phone and you end up having hooligans jumping the fence targeting those learners that have brought gadgets to the school…

The other problem as highlighted by the Neptune High principal involves educators within the school as they are sometimes a threat to school equipment. This is what he said:

This problem involves educators as well. Some of them are not trustworthy with the gadgets. So one always encourages educators to own these items brought to the school, for them to know that they belong to them as well…

It is a sad situation when school equipment disappears through the hands of teachers. They are employed to teach and should realise that whatever ICT equipment is there, it is for the benefit of both learners and teachers.

In conclusion, it is obvious that security at schools is a national concern, more so, as it affects the education of learners. Schools with ICTs, in particular, are a target for criminals. This poses a problem, as schools do not have adequate security to protect their assets. Learners are sometimes, attacked by criminals when bringing their cell phones to school for educational purposes. The disturbing part is that fellow learners are responsible for the attacks on other leaners by criminals. Lastly, one principal points a finger at some teachers for not being upright when it comes to computer hardware. Teachers are, at times, responsible for the disappearance of school computers.

5.4.1.4 THEME 4: Lack of clear direction (vision) for use of ICTs

Principals are instructional leaders at their schools. This includes efforts to introduce ICTs in the classroom. While principals may undertake efforts to introduce ICT at their schools and feel they have done enough, the reality is that without monitoring the ICT experience in the classroom, all may be in vain. This can be seen at Mercury High where the principal admitted that he had never attended a class where ICTs were being used. This is what he said:

I have not seen teachers in action making use of cell phones to teach learners except to say that sometimes I would hear that, since in our school we do not encourage learners to bring cell phones to the school, but they would ask in some cases for management to relax the rules because on that particular day they might tell the learners to come with their cell phones due to the nature of the content the teachers planned to teach.

The principal further added:

There may be real teaching and learning taking place in the classrooms but at the same time, it could be that they wanted to show the learners some of these learning materials that are in their cell phones and how to access them when they are at home. So far, I'm not sure how teachers are making use of technology.

A similar perception to the above was picked by the researcher during the interview with Neptune High principal while extolling the virtues of ICT uses at his school. This is what he *said:*

So ICTs save money for the school instead of buying teaching and learning material and makes things easier for the educators instead of using paper, photocopying, etc. All the assessments are there as well as the memoranda. They just access them. Everything is prepared for them as I am told.

The last line of the quotation suggests that he is not directly involved with ICT activities at his school. The possibility could be that he has delegated responsibilities to his deputy or departmental heads or he may not be aware of his leadership role in a school with ICTs. While interviewing the principals the researcher got the impression that while some principals may have received training about ICTs, they were not fully aware of their leadership role as school heads. Expert training is required for principals to enable them to fulfil their roles as ICT leaders in their schools.

According to (ISTE, 2009) the principal should nurture an environment of professional learning and innovation that empowers teachers to promote learning through technological and digital resources. Furthermore, the principal needs to involve him/herself in technology-based professional development and demonstrate skills of using ICT in his/her day-to-day activities in school (Mingaine, 2013). In the process, the principal becomes a role model for promoting the use of technology in the digital era (ISTE, 2009).

If the school principal does not involve him/herself in classroom activities, it would be impossible to fulfil the ideal espoused above. Principals need to appreciate that for ICT integration to be a success, the mere provision of infrastructure and equipment is not enough. They need to lead the integration effort from the front.

In conclusion, the theme suggests that principals do not monitor the work of teachers using ICTs. Admittedly, the principals have made the effort to bring ICTs to their schools, but they appear clueless as to how they are utilised during teaching and learning. By not monitoring ICT classroom activities, the principals are neglecting a major aspect of their duties as technology leaders.

5.4.1.5 THEME 5: Outdated school rules

In the schools that the researcher selected, one of the rules related to learners bringing cell phones to school. Learners are not allowed to bring cell phones to school. The two comments below from Neptune High and Mercury High principals, respectively, prove the point.

In our school prospectus or our code of conduct, it is indicated that cell phones are not allowed in our school. We do not encourage learners to bring cell phones to school…

Based on the above comments, school management teams need to consider researchers' Olofsson and Lindberg (2018) who undertook a study to determine learners' views on how ICTs could support their day-to-day activities and time at school. In some of the schools, learners were not allowed to use smartphones in the classroom. This was largely because teachers were not sure whether smartphones could be used for learning purposes. But while some learners saw the smartphone as a distraction, others saw it as a learning tool if used responsibly. The instant availability of the smartphone helped learners to remember assignment deadlines and that it could be used as a calculator.

School management teams need to realise that ICTs have altered the customary classroom setting, where the learner is viewed as a passive consumer of educational knowledge. In the modern ICT enhanced classroom, learners are active participants and collaborators in the sharing of information (Montrieux, *et al.,* 2015). Therefore, the researcher is of the opinion that this rule needs a review. While the rule may have been necessary a few years ago, it has been made obsolete by the fact that some teachers are advocating the use of cell phones in the classroom because of their ease of use. Furthermore, according to the Sun High principal, at his school, cell phones supplement tablets and computers as these are not sufficient for all learners at a given time.

This theme highlights the fact that some schools still do not allow learners to bring cell phones to school. This rule may have been based on previous experiences whereby learners have been irresponsible in their use of cell phones. But, it is clear that, if used responsibly, it can mitigate the shortage of ICTs in the township and rural secondary schools.

5.4.1.6 THEME 6: Benefits of ICT use

Most of the principals were eager to reveal how they and their schools have benefited from the presence of ICTs at their schools. They see a transformation in how things have since been done at their schools and ICTs have made life easier for all concerned. At Neptune High, apart from ICT use in the classroom, they use them for administration purposes. These are some of the comments from the school principals:

I will give an example of my management team particularly. Every work that you receive from the school management team (SMT) is not written by hand. ICTs provide an easy way of communicating. If you want to communicate with one another, you just press a button. If there is information required that involves the whole school; it is done at one point and is cascaded

to everybody within the school. So, it is a good way of communicating rather than writing circulars and all that which takes time as the circular has to go around for each person to sign.

Schools have become large and sometimes complicated organisations. In such a scenario, clear and effective communication channels become a necessity. Hard-copy circulars have become obsolete with newer forms of communication such as email and WhatsApp being largely used. Subject advisors, for instance, have created WhatsApp groups to communicate with teachers. The groups also allow teachers to communicate among themselves. This brings fellow professionals together to share matters of mutual interest, a step that can only enhance the teaching profession. However, there are still some grey areas of using social media for work purposes that still need to be fine-tuned. But, that requires the relevant parties to debate issues and come up with amicable solutions.

The Mercury High principal has noted a higher interest on the part of the learners with regard to school attendance. This is what he said:

One thing I can mention in general, of course, is that with the presence of such technology at our school is that the learners are looking forward to coming to school so that they can be able to make use of our computer lab because it is internet-connected, They can do research on their own. They can also access the available learning material on their own.

The above statement is in line with a study conducted across OECD countries which found that 88% of students (0-18 yrs) regarded the internet as a reliable resource for obtaining information (OECD, 2017).

The above statement compares with that of the Sun High departmental head who said:

Generally, I think young people today are excited about technology. They want to use it more. Obviously, they need to be guided. Learners understand things better more especially when they can see things.

The two statements indicate that schools need to increase technology use since learners show far more interest in learning where technology is involved. Children today are exposed to technology at a younger age than in the past. In OECD countries, 18% of students in 2015 had access to the internet for the first time before they reached the age of six (OECD, 2017). This figure would probably be influenced by a country's socio-economic status in terms of its citizens' ability to buy ICTs.

The Neptune High departmental head mentioned the matric results, among others, as where his school had seen the benefits of ICTs:

The improvement of matric results would be one of them, one of the things we are expecting to see and the covering of syllabi, that is ATPs. With the use of ICT these are faster than when using traditional methods. Completing the ATPs in time improves.

The Mercury High principal has also seen an improvement in the matric results at his school.

In his words, the quality of the results has also improved:

Somehow we have also noticed an increase in the number of bachelor passes although our school has not been doing badly we are seeing an increase in quality instead of quantity.

The school's departmental head agreed with the sentiment expressed by the principal when she said:

Our matric results tell us that there is a benefit brought by the use of technology.

The introduction of ICTs into teaching and learning was meant, among other things, to improve learning outcomes and to prepare learners for the 21st-century. While the schools, by their admission, have not reached the desired level of ICT integration, they are beginning to see an improvement in matric results, something that should be commended. This should serve to encourage other schools to adopt ICTs and persevere with them despite the challenges.

Reviewing the statement made by the Neptune High departmental head, there is an indication that the work of teachers has also improved. When teachers work well, that translates into improved outcomes for learners. The annual teaching plan is a significant document as it outlines all the work a teacher needs to cover during the course of the year. The amount of work a teacher covers has an impact on learners' final examination results.

The Saturn Secondary departmental head believes that ICTs have improved communication channels between teachers and learners. This has probably been the result of the use of social media platforms such as Facebook and WhatsApp as they allow quick interaction between parties. This is what he said:

Teachers can now share useful resources with learners via social platforms.

Furthermore, the use of social media platforms is accommodating of different learner personalities. For him ICTs:

…accommodate even those learners with less social skills as they are able to respond in group chats as opposed to contact sessions.

This point is important since learner behaviour in the classroom varies. Some learners can be extroverted and feel less constrained to participate in classroom activities, while others may be shy and easily mix with others. The researcher agrees with this statement as ICTs can allow such learners to be active in the classroom without feeling constrained by their introverted personalities.

For the Mercury High departmental head, ICTs have allowed learners and teachers to acquire computer skills they would otherwise have found difficult to obtain.

When learners leave our school, they already have some basic skills in the use of technology which gives them an advantage. Even teachers get a chance to improve their computer skills because previously some had very little knowledge about them.

This brings into sharp focus a point I highlighted in 5.4.2 concerning ICT training. The acquisition of skills is one of the long-term goals of ICT integration. Skills acquired in secondary school become useful when a learner proceeds to tertiary level or joins the world of work. Before the introduction of ICT integration, most learners would go to tertiary institutions without any knowledge of how to operate a computer, for example. This would immediately place that student at a disadvantage compared to those learners who had prior exposure to such technologies. So, the efforts of schools such as Mercury High are commendable as they are filling a gap that has previously been ignored.

The Saturn Secondary departmental head believes that ICTs have gone a long way to saving the environment. This is what she said:

Less paper is required for our operations, which saves money as well as the environment. By using ICTs, the school uses less paper which is an environmentally friendly practice. By using less paper, the school saves money and ink, which allows it to redirect the savings to other much-needed services or goods.

In conclusion, principals and departmental heads can see some of the changes brought by the use of ICTs. Computers are being used for administrative purposes, which greatly reduce paper use. Learners are showing greater interest in their school-work, which improves school attendance. Some of the schools have noticed an improvement in the Grade 12 examination results, a development they attribute to the availability of ICTs within their schools. This may be the result of the improvement in communication cited between the teachers and the learners. One departmental head acknowledges the accommodating nature of ICTs whereby an introverted learner is able to express him/herself through ICTs. Teachers are grateful that learners and teachers themselves have been able to acquire computer skills they did not

possess before the introduction of ICTs. Lastly, the use of ICTs means less paper is used by schools, which is environmentally friendly.

5.4.1.7 Theme 7: Funding barrier

Principals and departmental heads from the selected schools have embraced technology, and they see it as the future means of teaching and learning. While the schools have introduced ICT integration in their schools, they have had different experiences of it. What is common is that their ICTs have been donated by the private sector and the schools have a desire to increase the amount of equipment they have. This is borne out by the statements made by the Sun High and Mercury High principals:

I would say as schools, through the norms and standards we need to purchase our own tablets other than those supplied to us by NGOs.

In the Sun High principal's opinion, acquisition of extra ICTs should be incremental due to existing financial constraints:

We do not need to use the school funds at once, but we can acquire equipment in smaller instalments so that eventually each learner can have these tablets and laptops.

Let the government allow us to use the money since we are a Section 21 school. We could easily do that. We could simply use the money that is allocated to our school to implement the buying of e-books and tablets (Mercury High principal).

The Neptune High principal believes that collaboration among teachers can go a long way towards improving ICT integration:

I would recommend that educators work together as a team. Those that are teaching different subjects sometimes need to sit down together and see how they can integrate their subjects into one content.

The two comments by the Sun and Mercury High principals highlight financial constraints as the biggest threat to the success of ICT integration among township and rural secondary schools. As mentioned earlier, these schools do not charge any fees and are totally reliant on the government to survive. It is a widely known fact that state funds only cover the most basic of needs. Moreover, government funding comes with strict criteria on how to use it. Section 20 schools do not receive all their funding in cash but have to requisition for goods and services that they require. The other problem that schools face is the ever-changing nature of technology. Equipment becomes quickly outdated which may lead to schools with low funding being burdened with useless computer technology while still in the process of topping up

outstanding equipment. The researcher believes that seeking partnerships with NGOs and private sector bodies may result in the acquisition of more ICT for schools.

Departmental heads were also asked why they wanted to promote ICT integration. While the principals' responses had an administrative slant, departmental heads leaned more towards pedagogical matters. This is borne by the following testimonies. The Sun High departmental head would like to see his school have a more computer-based stream of subjects. This is what he said:

For me, I would want us to do Computer Applied Technology (CAT). I would want us to have a proper computer curriculum, which we do not have yet. I would recommend that we have a computer teacher who comes in to teach about computers and make that a part of our curriculum here at school. Technology is what is happening now and learners must be getting marks for that.

The researcher agrees with the above sentiment expressed by the Sun High departmental head. The world is moving towards a computer-based future. School curricula need to change to adapt to this reality. Policymakers are seemingly oblivious to this. I does not make sense to continue focusing on humanities-based curricula when pointers indicate that the future is digital. The researcher is not attempting to downgrade humanities as a field of study. However, indications are that learners are abandoning subjects such as Mathematics in large numbers. The 2019 matric results indicated a sharp drop in the number of learners who sat for Mathematics as a subject in the final examination (DBE, 2020). This is a worrying state of affairs as it could be indicating many deep-seated problems in the system. One of them could be a shortage of suitably qualified matric teachers. Another one could be the perceived difficulty of the subject and lack of interest by learners. Whatever the reason may be, research must be conducted to get to the bottom of the problem.

At Neptune High, the departmental head would like to see ICTs being introduced at the lower grades as it is currently being done by the senior classes:

I think this needs to be done mainly by the teachers and learners at lower levels first because as it is being introduced at the moment, it is being introduced to matric learners for the concern that we want better results from them. So, for it to be efficient it has to be introduced at the lower levels and we grow up with it. Even learners will get tuned to it from the beginning, not encountering it at the latter grades.

The Neptune High departmental head's sentiment needs to be heeded as focusing on the lower grades can have a long-term beneficial effect on learner performance. For example,

learners who reach Grade 12 with superior computer skills can do their research online, prepare assignments quicker, and generally make a teacher's work easier.

The Saturn Secondary departmental head felt that training needed to be conducted for key members of the school community:

I think it is important to educate management as a whole about ICT and its prospects and that includes the SGB members. It would also be important to provide training for all teachers with priority placed on the older generation of staff members.

A sentiment that slightly emerged during interviews was that of the school governing body (SGB) members who were sometimes difficult to convince about the beneficial effects of technology in the classroom. This resulted in the deferment in the purchase of much-needed hardware and software. Apart from difficult SGBs, some school management team members would not be supportive of efforts to promote ICTs, instead, preferring the use of the traditional chalkboard approach. Older teachers in some schools tend to resist any moves that would upset the status quo. Being set in their ways prevents them from trying out new things. They would also benefit from persuasion coupled with education on the benefits of ICTs. Also, when those in power are not supportive of innovations, it becomes difficult to push those innovations through. Therefore, training would also be beneficial to them as well.

The Mercury High departmental head felt that specialised classrooms were the way to go. This would reduce teacher movement during classes as classrooms would be fitted with equipment for purpose. This is what she said:

It would help if every subject had a classroom. For example, I would like the school to have a Mathematics room, whereby the learners go to it and find the teacher there. Each classroom could then be kitted with the relevant technological equipment, which is impossible right now as the teacher has to move from class to class. Of course, this would be expensive in terms of costs. For me, this would be the ideal situation.

While the above sentiment is a laudable one, financial constraints, as the departmental head admits, would make the ideal difficult to achieve. While the schools have the rooms, a shortage of ICT equipment would cause the idea to collapse. However, the researcher believes that innovative thinking about the composition of the school timetable can go a long way towards achieving the departmental head's idea. The available resources can be shared by all learners and staff members if schools were guided by a common ICT vision that promotes access for everyone. The school can also use platooning to provide access to every learner and teacher.

Ultimately, the researcher believes that in their current state, township and rural schools will not achieve the envisaged ICT integration as practiced in most Western and Asian countries, due to several factors that have been highlighted in this chapter. Yet, the limited ICT means available can make a difference in the lives of the learners who have gone through them.

In conclusion, principals and deputy principals of the selected schools see the need to increase the number of ICTs they have, but, lack of funds is a stumbling block. While they can see the benefits, as “no-fee” schools, strict financial restrictions prevent them from increasing the number of available tablets, for example. To counter this problem, one principal suggested that schools buy equipment incrementally, using the resources they have. Principals are keen to see teachers teaching different subjects collaborating on how to improve ICT integration. This would ensure that teaching is streamlined to produce a well-rounded outcome. One departmental head expressed a wish for his school to have a computer-focused stream that would offer learners a comprehensive grounding into computer technology. Another departmental head wanted to see ICT integration being introduced in the lower grades since currently, the focus is on Grade 12. This would ensure that learners are familiarised with technology at a younger age. ICT training for SBG members and older teachers was recommended. Another point raised was to see ICTs being available for all the subjects, with dedicated ICT-kitted classrooms for each subject. This would put an end to the current practice where the teacher has to move with ICTs from one class to the other, risking damaging the equipment in the process.

5.4.1.8 Theme 8: Support from the school principals

Three of the departmental heads interviewed commended their principals for the amount of support they were giving the teachers to promote ICT integration. The Sun High departmental head was of the opinion that his principal was a critical element in the ongoing ICT integration project. This is what he said:

I would say the principal is the major support because, from time to time, he gets the computer lab revitalised. He would call technicians to check if the computers are still working. He makes sure that everything is in working order. The projectors are also checked for their functionality. With the tablets as well, apart from the people entrusted to run the project, he oversees that it still runs, the teachers and learners are using it and how interested they are in the project.

In the above testimony, the principal ensures that ICTs at his school are always functional. He takes the lead to ensure that the necessary repairs are carried out timeously. Sweeney (2012) lists the maintenance and sustainability of ICT infrastructure at school as one of the responsibilities of the principal at school. It is encouraging to see principals such as the one

at Sun High. His involvement with ICTs in his capacity as a principal is a display of his leadership in promoting integration. In many schools, principals tend to be stumbling blocks whenever new developments are mooted. This serves to discourage teachers from supporting and being part of such developments.

The Neptune High departmental head also highlighted the role played by her school principal in support of ICT integration. This is what she said:

The principal has facilitated the supply of these gadgets from the sources I mentioned earlier during the interview. He also tries to provide security for the equipment that has been supplied so that it does not get stolen easily.

As mentioned earlier in this chapter, lack of adequate security is a hindrance to many schools from disadvantaged communities. Schools experience severe setbacks when computer equipment is stolen as it has a negative impact on ICT integration. The Neptune High principal is seen by one of his subordinates as a supportive individual who ensures that ICT equipment at his school is safe from burglaries.

The Mercury High departmental head believed that the use of the computer lab would be low if the principal was not giving any support:

We do receive a lot of support from our principal. The ICT resources that have been acquired are mainly due to him and his management team. I also think that if the management team was not insisting that the computer labs be used, the labs would become white elephants. They insist that we as subject teachers and departmental heads account as to how we have used technology in our subjects. That for me constitutes support on their part. So all subject teachers feel obliged to use the computer lab due to the insistence of the principal and the deputy. So, there is some form of support being given.

In the above testimony, two positive points about the principal are mentioned. Firstly, he has been at the forefront of the acquisition of ICTs through sponsorship. Secondly, he encourages teachers to use the computer lab through engendering accountability on their part about its use. A principal who ensures that teachers are at the forefront of developments fosters hope amongst staff and is likely to instil a willingness to grow among staff. There is a widely spread perception that older teachers are resistant towards embracing technology. If that were the case, the researcher believes that some form of persuasion coupled with accountability can encourage the older teachers to be part of the technological revolution and avoid being left behind.

In this section, departmental heads show principals as being supportive of ICT integration. The principals are seen as the drivers of the integration effort. They ensure that the laboratories are always ready to serve their purpose, which is part of their duties as principals. The principals continuously encourage teachers to use ICT as they are aware of their benefits. Encouragement from the principals tends to have a motivating factor for other teachers to use ICTs.

5.4.1.9 Theme 9: Replacing textbooks with ICTs

In the next testimony, the Neptune High principal provides another dimension to his school's use of ICTs. The school mainly use textbooks to access learning material but on top of textbooks, his school also uses ebooks (electronic books). This is what he said:

We have ebooks now, which help us a lot as a "no fee school". We access those ebooks via the ICTs and learners are able to read those books that are provided within the system itself. So ICTs save money for the school instead of buying teaching and learning material and makes things easier for the educators instead of using paper, photocopying, etc.

The Sun High departmental head also hinted at study material that is available for his school in electronic format. These were his words:

Our school is a "no fee" paying school. That means even though we get textbooks from the department of education, we have to keep on topping our textbooks up. We do not really have enough textbooks at the school, but with the soft texts that are available in the tablets, it helps to reduce overreliance on hardcopies of textbooks.

In being asked what he would like to see happening with regard to ICT integration, the Sun High departmental head said:

On the side of the tablets, I would like to see us using them more as textbooks. Knowing exactly what is in there and teachers giving themselves time to know what is in them and make sure that all the information is used because from what I hear from learners, it is easier to grasp what they get from such media.

Looking at the three statements above, they seem to give a compelling reason to move towards ICT use at schools. In the first statement, the idea of replacing textbooks with the electronic format is highlighted. The use of textbooks has proven to be problematic for many schools, owing to several factors, among them being poor retrieval policies and rapid wear and tear caused by poor handling. The result, as mentioned in the quotation, is replacing the books to enable learners to access them. However, books have become expensive, and with

looming budget cuts within government departments, it will increasingly become difficult to replace them. The solution may lie in ebooks as the “textbooks” of the future. Ebooks may prove to have a longer lifespan than traditional books. They do not need a lot of physical space to store, and a big number of ebooks can be carried at a time.

The use of ebooks is ecologically friendly. A huge amount of paper is required to manufacture books. So, the ideal of classes where no paper is used is much closer.

To conclude, some schools have noted that ICTs offer wider possibilities than traditionally thought. Problems encountered with the use of textbooks can be mitigated through the use of ebooks. Ebooks have money-saving advantages for schools as they reduce the need for photocopying learning materials. This has advantages for the environment.

In the next section, the second data collection technique used, which is non-participant observation, will be discussed.

5.5 NON-PARTICIPANT OBSERVATION

Non-participant observation is the second data-gathering technique the researcher used as part of the study. This is a method of observing participants without active participation. Non-participant observation is used to understand a phenomenon by entering the community or social system involved while remaining detached from the activities being observed (Liu & Maitlis 2010).

Observation can be a three-part process, which begins with descriptive observation. Here, the researcher carries out a broad scope observation to get an overview of the setting. This is followed by focused observation in which the researcher starts to pay attention to a limited portion of the activities he/she is interested in. Selected observation then follows where the researcher investigates relations among the elements he/she has selected as being of the most interest (Liu & Maitlis 2010)

Non-participant observation was used to focus on the physical characteristics of the computer labs, the manner in which ICTs were used, and the conduct of the participants during lessons. The purpose was to supplement the information supplied by the school principals and departmental heads during the interviews. The use of non-participant observation proved to be of great value to the researcher as it helped corroborate statements made by the participants. An observation schedule with predetermined areas of focus was used to collect data, which was then written down in the form of notes.

Information from non-participant observation from the four purposely sampled township and rural secondary schools highlighted the following:

- The schools were resourced with ICTs in the form of desktop computers, tablets, overhead projectors, television sets and some had whiteboards. Each school had at least one classroom used as a computer lab with a capacity to sit between 40 and 50 learners.
- The schools have approximately 50 tablets each. This highlighted the shortage of ICTs in the schools as all had a learner enrolment of no less than 800 each.
- All four participating schools had some form of internet connectivity.
- In two of the secondary schools, not all subjects were taught using ICTs. Only Mathematics and Physical Sciences were taught using ICTs. The main reason was that the software installed in the tablets catered only for the two subjects.
- The pattern of the lessons observed was more or less similar. The teacher would introduce the day's activity. He/She would then demonstrate on a big screen how the learners were expected to execute their tasks.
- Learners were free to enquire when in difficulty by simply raising their hands.
- There was notable ease of use of the ICTs during lessons. In cases where learners were struggling in opening the relevant pages, teachers were there to offer assistance.
- Learners displayed more enthusiasm during lessons when using ICTs than when they were not. This was noted due to the serious attention the learners paid to their tablets and computers. Disciplinary matters such as noise and lack of attention on the part of the learners were minimal.
- There was notable ease of use of the ICTs during lessons. In cases where learners were struggling in opening the relevant pages, teachers were there to offer assistance.
- One of the secondary schools had a computer literacy course which is not part of its curriculum. Only Grades 8 and 9 were required to attend this course.
- Projectors saved time as most of the information projected on the screen was prepared in advance. The teacher did not need to spend time drawing figures on the board, for example, as in a traditional classroom setting.
- The researcher did not see a single principal entering or monitoring a lesson where ICTs were used. Maybe they felt that the departmental heads were the ones supposed to monitor lessons of this nature. The fact that so far not all teachers use ICTs in their subject could also have been another factor.
- Departmental heads appeared to have a greater interest in what was taking place in lessons where ICTs were used.

Participant observation indicated that the situation at schools, concerning ICT integration, is still in its infancy in KwaZulu-Natal township and rural secondary schools. In all the schools that the researcher selected, none of the ICTs available came from the provincial education department. The equipment came through donations from NGOs and some private sector companies, which had seen the need for schools to start using ICTs as part of their teaching and learning activities, hence the pilot projects. Furthermore, the volume of ICTs available was too low to cater for the needs of the schools as they had far higher learner enrolment figures.

Two other points worthy of discussion were that the secondary schools participating did not have a vision on the use of ICTs. Furthermore, ICT use lacked collective and collaborative leadership. It was left to the individual teachers who used ICTs to operate as they deemed fit. This is in contrast to Bialobrzeska and Cohen (2005); Dexter (2008) who opine that schools need to develop a vision for the use of ICTs. These researchers contend that a shared vision guides and develops the school's strategic plan, which provides the members of the school community a common direction, which enables people to work together. Dexter (2008) further avers that for ICT leadership to be successful, it should not be assigned to an individual. This opinion is based on the results of a study Anderson and Dexter (2008) conducted where it was found that in the US schools shared ICT responsibilities between the principal, a technology coordinator, and other teacher leaders, this served to distribute leadership of the use of ICTs and prevents the concentration of leadership on an individual.

The concerned parties need to address the last two points, as they are crucial to the successful integration of ICTs in schools. While the education department is expected to provide the necessary equipment and support, school leadership needs to play the implementing role to ensure that projects are a success. While the shortage of ICTs cannot be discounted, it should not stand in the creation of planned and coordinated activities to ensure success.

This researcher believes that a massive financial investment needs to be made by the government, the private sector, and NGOs in terms of equipment provision, training of educators in the use of ICTs, and upskilling of school managers on their roles as ICT leaders.

Document review was the third data collection method utilised to obtain more information on the perceptions of school management teams with regard to ICT integration in the township and rural secondary schools in KwaZulu-Natal. The researcher felt that it was important to document review for triangulation purposes. The significance of triangulation in this study was to test, verify, compare, and corroborate research findings generated by each data collection method. The content found in documents is discussed in the upcoming section.

5.6 DOCUMENT ANALYSIS

The *Oxford School Dictionary and Thesaurus* (2007) defines a document as a written or printed paper giving information or evidence about something. In social research, document analysis can involve an examination of documents, artefacts, archival records, videos, or social media information related to the phenomenon being studied (Yin, 2016).

Document analysis is a type of qualitative research in which the researcher interprets documents to give voice and meaning around a research topic (Bowen, 2009). Analysing documents includes coding content into themes comparable to how the interview transcripts are analysed (Bowen, 2009).

According to O' Leary (2014), there are three primary types of documents:

- Public records (These are official, ongoing records of an organisation's activities)
- Personal documents (These are first-person accounts of an individual's actions, experiences, and beliefs)
- Physical evidence (These are physical objects found within the study settings)

O' Leary (2014) proposes that before document analysis can take place, the researcher needs to go through a comprehensive planning process to ensure reliable outcomes. This process should include the following eight steps:

- Creation of a list of texts to explore
- Consideration of how texts will be accessed with attention being placed on linguistic and cultural barriers
- Acknowledgement and address of biases
- Development of appropriate skills for research
- Consideration of strategies for ensuring credibility
- Knowledge of data one is searching for
- Having a backup plan

Data analysis also involves thematic analysis, which takes emerging themes and turns them into categories utilised for further analysis (Bowen, 2009). The researcher needs to maintain a high level of objectivity and sensitivity for document analysis' results to be credible and valid (Bowen, 2009).

In this study, the prime intention of the researcher was to explore school management teams' perceptions of ICT integration in the township and rural secondary schools in KwaZulu-Natal province. As a result, the researcher utilised national and provincial ICT policy documents that

were available, reports, newspaper and magazine reports, and guideline documents that comment on ICT matters. The purpose of this exercise was to gain a deeper understanding of school management teams' perceptions and understanding of ICT integration in teaching and learning. The researcher made enquiries at the schools visited about internal ICT policies but none were provided. The researcher concluded that the school ICT policies did not exist.

The following table lists the documents and the data analysed in the selected documents.

Table 5.1

Documents and data analysed

Documents chosen	Data analysed
• White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies 2004	• The use of ICTs in education, strategic objectives, funding, safety and security, and resourcing
• KZN Department of Education Strategic Plan 2017/18-2019/20 • Updated Strategic Plan 2015/16-2019/20 • Pillar 7: Information and Communication Technology	• Pillar 7: Information and Communication Technology: Resourcing
• The National Education Collaboration Trust (NECT)- Interim Integrated Report 2014/ Development of an ICT Strategy	• Envisaged ICT scenario; role of technology in education management
• Guidelines for Teacher Training and Professional Development in ICT 2007	• Benefits of teaching and learning through ICTs
• Status Report on the implementation of e-Education 2013	• Provincial ICT infrastructure provision
• Information and Communications Technologies and Secondary Education in Sub-Saharan Africa: Policies, Practices, Trends and Recommendations 2019	• Use of free-to-air television to deliver content to schools

• Managing ICTs in South African Schools 2005 - A guide for school principals	• Benefits of ICT use to learners
• The Status of ICT in education in South Africa and the way forward NECT 2016	• Teacher professional development
• Provision of ICT in Schools: Department of Education and Department of Telecommunications and Postal Services briefing 2016.	• Provision of ICT in schools
• Guidelines on the Management and Usage of ICTs in Public Schools in Gauteng 2016	• Management's responsibilities
• Rapid research on the use of ICT in education, South African Institute for Distance Education 2015	• Local and international best practice on classroom ICT use

5.6.1 Approach used in document analysis

Document analysis was based on the themes that emerged during the interviews with principals and departmental heads. A deductive approach was used. Triangulation was served by the use of predefined themes and codes to establish corroboration of findings from the interviews, non-participant observation and document analysis. The following section deals with the themes and sub-themes from the identified and pertinent text passages.

5.6.1.1 Theme 1: Challenges concerning ICT infrastructure

The KwaZulu-Natal Department of Education (KZNDoE) recognises the importance of the provision of ICT infrastructure at schools to improve learning outcomes. Focus has been placed on rural schools, which suffer from historical neglect owing to past political practices:

Learners do not have sufficient support structures to assist them after school to continue the learning process and South Africa's rural schools, in particular, are poorly equipped and have crumbling infrastructure. The deployment of ICT resources and services in schools and communities extends the learning experience beyond the confines of the classroom and makes it possible for learning to take place outside school hours (KZNDoE Strategic Plan2017/18-2019/20).

The KZNDoE has committed itself to address the shortage of ICT infrastructure in schools:

The KZNDoE is mindful of the fact that ICT has been used to accelerate service delivery and improve people's lives. The Department has embarked on a number of ICT in Education initiatives to support teaching and learning and improve learner attainment. These initiatives include the provision of ICT resources and infrastructure to schools; the development, curation and distribution of apposite and interactive digital content to learners and teachers; the use of ICT platforms to ease the administrative burden; the professional development of educators (school and office-based) on the use of ICT to deliver, manage and support curriculum (KZNDoE Strategic Plan 2017/18-2019/20).

The above statements are in line with the provisions of the 2004 White Paper on e-Education, which states:

ICTs have the potential to improve the quality of education and training. It is for these reasons that Government has been quick to seize the opportunity presented by the practical benefits of ICTs to support teaching and learning in the twenty-first century (Government Gazzette No 26762, 2 September 2004).

The White Paper further recognises the impact that ICTs have had in the provision of education and recognises the challenges that exist:

The ICT revolution has had an impact on curriculum development and delivery and continues to pose new challenges for education and training systems around the world. These challenges can be summarised into three broad areas, namely:

- participation in the information society;

-impact of ICTs on access, cost effectiveness and quality of education; and

-integration of ICTs into the learning and teaching process (Government Gazzette No 26762, 2 September 2004).

In a development that took place at a national parliamentary level in 2016, the Department of Telecommunications and Postal Services met jointly with the Department of Basic Education regarding the provision of ICT connectivity in all schools across South Africa. Additionally, the meeting involved stakeholders, including the Independent Communications Authority of South

Africa (ICASA) and the Universal Service and Access Agency of South Africa (USAASA) as well as other representatives of educational and network operations.

The main issues discussed by the presenters were as follows:

- *It was crucial to define clearly what was meant by connectivity and clarify the roles and responsibilities of all stakeholders involved in the plan.*
- *It must be noted that ICT was not the solution, but instead, a means to the solution.*
- *There was a strong focus on the training of educators, as this was crucial to the implementation, process and success of incorporating ICT in schools.*
- *Educator training aimed to focus on advancing the abilities, skills and capacity of teachers in order to be able to deliver accordingly and enhance their teaching, thus adequately being able to deliver the knowledge appropriate in equipping learners' learning and performance; this also ensured that educators were able to deliver quality teaching to learners.*
- *There was a focus on schools in rural areas and schools with special needs, as many had been previously excluded in previous attempts at the connectivity of schools.*
- *Schools were to be given 20GB internet data for use, and any excess would have to be paid by the school at e-rates.*
- *A major challenge highlighted was that funds were not enough, and this made it difficult to effectively carry out the rollout* (Parliamentary Monitoring Group 2016).

5.6.1.1.2 Inadequate computers

Statistics available indicate the progress that has been made to equip schools with computers in the KwaZulu-Natal province (DBE 2013). Figures from Gauteng and Western Cape have been included for comparison purposes. The table indicates that the latter two provinces are far ahead in terms of computer provision in their schools compared to KwaZulu-Natal. But, it should be noted that KZN has more schools under its jurisdiction than the other two provinces combined.

Table 5.2

Provision of computers in schools in KwaZulu-Natal, Gauteng, and Western Cape Provinces.

Province	No. of schools	No of schools with computers for administration	% of schools with computers for admin.	No. of schools with computers for Teaching and Learning	% of schools with computers for Teaching and Learning
KZN	6008	2462	41	992	17
GP	2483	1796	72	1571	63
WC	1616	1350	84	1280	79

(Department of Basic Education, 2013)

In a joint parliamentary meeting between the Department of Basic Education and the Department of Communications and Postal Services in 2016, among the issues discussed was the rollout of computers to both urban and rural schools in South Africa. From the report that came out after the meeting, the following is one of the statements made:

The rollout plan was pro-poor, with a focus on bridging the digital divide between urban and rural schools. Learners in poor schools would be given tablets in order to enhance learning through various models and the learners' capabilities. Learners from schools in the fourth and fifth quintiles were included in this model and process, but they had to bring their own devices to class (Parliamentary Monitoring Group 2016).

5.6.1.1.3 Software

The 2004 White Paper on e-Education recognised the dearth of software existing at the time of its release. The next statement highlights the point:

Internet access is becoming more common, but the use of the internet for teaching and learning purposes is very limited, due to high connectivity and telecommunication costs, lack

of local content and examples, and inadequate technical and pedagogical support at local level (Government Gazzette no 26762, 2 September 2004)

Countries in Sub-Saharan Africa, including South Africa, are using educational television in support of education. The document: Information and Communication Technology and Secondary Education in Sub-Saharan Africa, gives an outline of this alternative channel of content dissemination:

Some countries are using educational TV to complement or supplement the Internet. A number of secondary schools across sub-Saharan Africa employ educational television at the secondary level. For instance, South Africa's Department of Basic Education has provided 1600 schools with educational television programming. These include free-to-air channel "e.tv" (an entertainment channel), the 24-hour news channel eNCA, educational content produced by the South African educational TV content provider, Mindset, and on-demand educational broadcasting that teachers can use. Schools pay for the TV and decoder and receive OpenView High Definition (OVHD) free-to-view direct broadcast satellite television (Burns & Santally 2019).

5.6.1.1.4 Lack of funds to buy computers

The joint meeting between the Department of Basic Education and the Department of Communications and Postal Services in 2016 highlights one of the challenges of computer provision, based on the recognition of economic disparities existing within the South African population. Plans were made for the distribution of computers to schools.

5.6.1.1.5 Internet connection

When the White Paper on e-Education was released, a scenario was envisaged where the government was to fund the rollout of internet infrastructure. The next two statements provide evidence:

Statement 1

The Minister of Communications will determine the formulae for apportioning of universal service funds for the payment of subsidies to GET and FET institutions for the procurement of Internet services and the equipment required to access the Internet, as stated in the Telecommunications Act 103 of 1996 and amended in 2001 (Government Gazzette No 26762, 2 September 2004).

Statement 2

The legislated e-rate, a discounted connectivity rate, is designed to ensure that the cost of basic connectivity is affordable. Government will implement the e-rate. The discounted e-rate will be reviewed, in conjunction with the Universal Service agency obligations, against the recurring connectivity costs (Government Gazzette No 27662, 2 September 2004).

In a meeting that took place in parliament between the Department of Basic Education and the Department of Communications and Postal Services, twelve years after the release of the White Paper on e-Education, some key issues were raised:

> *- The issue of budget constraints and sustainability of the provision of tablets remained a problem. Additionally, the 20GB cap was said to be small, especially if connected schools were to act as community internet hubs. This needed to be addressed and also indicate where poor schools, especially in rural areas, would get the funds to pay for e-rates following the depletion of the 20GB.*
>
> *- It was important to outline the operations and logistics of the plan, highlighting whether IT specialists would be present on site to deal with issues of updating and refreshing devices.*
>
> *- There should be a move from 3G to 4G, as 3G was too slow, especially in schools located where the network was already a problem* (Parliamentary Monitoring Group 2016).

5.6.1.2 Theme 2: ICT Training

The White Paper on e-Education recognised the teaching and learning of basic computer skills as an important element towards ICT integration:

In both primary and secondary schools, the teaching of basic computer principles and word processing skills forms the most important component in the teaching of computer literacy. Limited integration into teaching and learning is also evident (Government Gazzette No 26762, 2 September 2004).

In the next quotation, the White Paper acknowledges the ICT skills gap that existed at the time among teachers and learners:

Beyond the issue of access, there is a gap in the ability of learners and teachers to use these technologies effectively, to access high-quality and diverse content, to create content of their own, and to communicate, collaborate and integrate ICTs into teaching and learning. The professional development of teachers in these areas must go hand-in-hand with increased access to ICT resources for teaching and learning (Government Gazzette No 26762, 2 September 2004).

Teacher Professional Development is recognised as a critical component of ICT integration in teaching and learning. Amory *et al.* (2015), offer a blueprint for this critical element:

5.6.1.2.1 Strategy for teacher professional development

-The development of attitudes, skill and knowledge (both technical and pedagogical) of pre- and in-service teachers is a prerequisite for successful use of technology in the classroom,

- The use of technology literacy programs can support the development of technical skills,

- Scaffolded teacher professional development (TPD) opportunities should be provided to help teachers organise the use and development of cognitive ICT tools,

- An appropriate technology integration framework should include technology skills development and pedagogical use of technology, and

- Successful TPD initiatives that improved the use of ICT teaching included: sessions of online collaborative group work, 12-week collaborative enquiry-based learning practices, and time spent on professional development activities (DoE 2007).

5.6.1.2.2 *Guidelines for teachers*

-Teachers need to learn technology integration strategies and must learn to support their students,

- Teachers also need to understand the role of ICT in Education policy, curriculum, and assessment, and organisation and administration,

- Models that incentivise teachers (e.g., through 'earn as you learn') work well,

- Sharing among teachers allows teachers to take ownership of technology and develop confidence, and

- Support from more knowledgeable colleagues and leaders is helpful (DoE 2007).

But, in the same document by Amory *et al.* (2015) there is an indication that not much progress has been made with regard to TPD. Shortcomings appear to be district, provincial and national levels of education management. The following are the drawbacks highlighted:

- *A regulatory framework exists that allows for the integration of ICT in TPD, but evidence of progress with implementation does not exist.*
- *There is no national curriculum for TPD.*
- *TPD is driven by individual educational institutions and solution providers.*
- *There is a need to develop the capacity of districts to procure TPD services.*
- *TPD should be seen as a continuum of initial/ pre-service to continuing/in-service training, and conceptualised as ongoing* (Amory 2015).

5.6.1.3 Theme 3: Security

The 2004 White Paper on e-Education recognised the importance of safety and security of ICTs at the school level. The Government acknowledged its responsibility in ensuring that safety security measures were put in place, through the relevant norms and standards applicable to all schools falling under it:

The Department of Education will develop norms and standards to ensure the safety and security of ICTs. Both skills and development of teachers and communities should be built around crime prevention and safety of ICT facilities (Government Gazzette No 26762, 2 September 2004).

The joint parliamentary meeting between DBE and the Department of Communications and Postal Services also highlighted the issue of safety and security in schools:

Moreover, another issue that was discussed was theft and security concerns, including the key role of various stakeholders such as the South African Police Service, parents and the community at large (Parliamentary Monitoring Group, 2016).

5.6.1.4 Theme 4: Lack of clear direction (vision) for use of ICTs

The researcher did not access documentation based on this subject. Future research, could yield more information on this theme.

5.6.1.5 Theme 5: Outdated school rules

The researcher did not locate any form of documentation in relation to this theme. This may be due to the novelty of school rules having an impact on the use of ICTs in teaching and learning. Future research may, however provide more insight.

5.6.1.6 Theme 6: Benefits of ICT use

The introduction of ICTs into teaching and learning is geared to equip learners with an array of skills. These skills are meant to enable learners to function the knowledge economy that is the twenty-first century. The Department of Basic Education (2007) document outlines the skills learners need to acquire:

Successful integration of ICT into teaching and learning can ensure a more meaningful interaction of learners with information. ICT can promote the development of advanced cognitive skills such as comprehension, reasoning, problem-solving and creative thinking, as well as the ability of learners to:

- *Identify and solve problems and make decisions using critical and creative thinking strategies;*
- *Work effectively with others as members of a team, group, organisation and community;*
- *Organise and manage themselves and their activities responsibly and effectively;*
- *Collect, analyse, organise and critically evaluate information;*
- *Communicate effectively using visual, symbolic and/ or language skills in various modes;*
- *Use science and technology effectively and critically, showing responsibility towards the environment and the health of others; and*
- *Demonstrate an understanding of the world as a set of related systems by recognising that problems cannot be separated from their contexts.* (DBE, 2007).

In addition to supporting the model of teaching and learning, ICT plays a role in support of the operation of the education system. Examples of the application of ICT into management include:

- *Collecting management information such as learner records, teacher records, test results, etc.*
- *Automatic management activities, e.g. preparing financial statements, developing school timetables, calculating and paying teachers' salaries.*

- *Reporting management information at various levels of the system i.e. the school headmaster, the district, the provincial department and national department. (NECT.org.za, 2018).*

Current studies suggest that the ICTs are not fulfilling the role they were meant to. A study conducted by Amory, *et al.,* (2015) indicates the extent of the existing challenges. The following were some of the findings:

-There is lack of integration of ICT into the organisational culture of schools and districts.

- School management teams make little use of ICT in execution of their responsibilities.

- Teachers and principals are isolated from district e-learning units, leading to superficial knowledge of e-education policy and incoherent actions.

- While the South African School Administration and Management System (SA-SAMS) has improved capturing of data at school level, the functionality of the system is under-used: it is not web-enabled, which means data collection is costly and inefficient; accuracy and completeness of data is poor; staff at school and district levels have limited opportunities to access data on the system; and the reliability of the data is questioned.

-On-going technical and user support for SA-SAMS is lacking, resulting in schools choosing to use other systems even when these are charged for (Amory, *et al*.,2015).

5.6.1.7 Theme 7: Funding barrier

The introduction of ICTs into teaching and learning was meant to bring about achievable goals.

According to the United Nations Scientific and Cultural Organisation (UNESCO), the function of ICTs in Education is to support the present-day “knowledge society” (UNESCO, 2011):

- *To build workforces which have ICT skills to handle information and are reflective, creative and adept at problem-solving in order to generate knowledge*
- *To enable citizens to be knowledgeable and resourceful so they are able to manage their own lives effectively, and are able to lead full and satisfying lives*
- *To encourage all citizens to participate fully in society and influence the decisions which affect their lives, and*
- *To foster cross-cultural understanding and peaceful resolution of conflict.*

UNESCO defines these social and economic goals as the centre of a country’s education system, and teachers need to be skilled to fulfil these roles (UNESCO, 2011). This means that

the use of technology in teaching and learning is not just about improving learner marks, but has a broader impact in terms of preparing learners to participate in the knowledge economy (Amory, 2015).

5.6.1.8 Theme 8: Support from principals

Amory, Rahiman and Mhlanga (2015) provide a research-based blueprint for the role of school management, under the leadership of the principal, for successful ICT integration implementation.

Management should establish a vision and show leadership.

- *School-related policies, such as an ICT plan, ICT support, and ICT training, have a significant effect on class use of ICT*
- *School leadership is the single most important factor determining whether ICT integration is successful*
- *A well-funded, well-managed, and well-supported school ICT environment is the foundation needed to support teaching and learning with technology*
- *Projects that work best are those where there is sufficient accountability and frequent reporting of performance targets*

The Gauteng Department of Education (2016) clearly outlines the role of management in ICT integration at schools. Without the visible participation of school leadership, the integration effort is unlikely to succeed. The department's document opines:

The overall responsibilities for school managements are that they manage both the "e-Readiness" and the "e-Maturity" of their schools. "E-Readiness" relates to the responsibility to provide and maintain the basic infrastructure that supports ICT usage in the school. "E-Maturity" relates to the responsibility to support the progressive increase in the usage of ICTs in the school. An important indicator of whether or not ICTs will be successfully integrated into the school context is the attitude of leaders in the school towards ICTs. Leaders' perceptions of the importance of ICTs, their own use of ICTs and their ability to create a supportive and enabling environment for effective use of ICTs in the school are critical.

5.6.1.9 Theme 9: Replacement of textbooks with ICTs

Textbooks are one of the pillars in an education system. Teachers and learners rely on textbooks as they contain the organised bits of knowledge forming teaching and learning

material. Their absence, arguably, render pedagogical activities incomplete. Many schools have to deal with shortages of textbooks due to non-delivery, damage because of neglect or loss. In cases where they are available, learners complain about the heavy burden brought upon by textbooks, especially when using public transport or taking long walks to school and back. This inevitably results in the textbooks being left either at home or at school. When the teacher instructs the learners to consult a particular textbook during a lesson, he/she discovers that some learners have left them at home. This becomes frustrating as it, not only slows down the lesson, but also has the effect of leaving those learners without textbooks behind.

The move towards 21st-century teaching and learning methods, call for a re-think in the way learner support material is organised. Nowadays, technology allows for the compression of large volumes of work into smaller units such as compact discs and USBs. This approach would ease the way towards an environment where less or no paper is used in the classroom. However, this scenario would need to be accompanied by the concomitant availability of relevant hardware for use by both teachers and learners.

5.7 CONCLUSION

The previous chapter highlighted the significance of the qualitative research design and the use of the case study in particular for this research project. This chapter was made of two sections, namely, data analysis and the discussion of findings. The first section dealt with the analysis of data and the discussion of the empirical findings. The second section dealt with evaluation and a discussion of various documents on ICT integration in teaching and learning. The first aspect of the empirical findings focused on brief profiles of the participating schools. The findings were presented and augmented by participants' quotations to answer the research questions outlined in Chapter 1. The interview data were followed by a report stemming from non-participant observation. The last section of the chapter concerned a document analysis. The next chapter deals with the summary, conclusions and recommendations based on the study.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

Chapter 5 centred on the discussion of the findings of the empirical study and the literature analysis, and the themes and the sub-themes emerging from the research data were highlighted. The main objective of the study was to investigate school management teams' perceptions of ICT integration in the township and rural secondary schools in KwaZulu-Natal. To this end, the researcher hopes that this study has gone some distance towards uncovering the perceptions of school management teams towards ICT integration. The literature review conducted in Chapter 2 displays the role played by ICT in teaching and learning. The results of the study reported in Chapter 5 provide answers to the following research questions:

- How do principals perceive the integration of information and communication technology at the school?
- How do departmental heads perceive the integration of information and communication technology at the school?
- How can integration of information and communication technology at the school be improved?

The answers provided to the research questions helped in the achievement of the following study objectives:

- Enquire how principals perceive the integration of information and communication technology at the school.
- Explore how the departmental heads perceive the integration of information and communication technology at the school.
- Determine what can be done, based on the literature review and the findings of the empirical study, to improve the integration of information and communication technology at schools.

6.2 SUMMARY OF CHAPTERS

The study was divided into six chapters to answer the main research question by finding answers to the sub-questions as follows:

Chapter 1: Introduction and overview

The chapter provided the background to the study. Aspects that are presented in this chapter are: background information to the study, theoretical framework, problem statement, rationale for the study, the research questions, aims of the study, significance of the study, the research methodology, ethical considerations, trustworthiness, the researcher's assumptions about the study, clarification of terms, an overview of the study and conclusion.

Chapter 2: Literature Review: Theoretical Framework for The Use of ICTs in Teaching and Learning

The chapter began by examining teaching and learning in the 21st-century. This was followed by a discussion on leadership in the use of technology in schools. Leadership and learning theories about the use of information and communication technologies in teaching and learning were then discussed. The chapter then focused on NETS-A, which provides a conceptual framework for the study. The chapter concluded with a discussion on barriers to the use of ICTs in schools.

Chapter 3: Literature review: Technology and Integration in Teaching and Learning

This chapter focused mainly on the role of technology use and integration in teaching and learning. It began with a rationale for the use of computer technology in education. This was followed by an examination of policies of technology use in education in different countries. These countries were Canada, Finland, Malaysia, Kenya and South Africa. The chapter continued with a discussion on the impact of information and communication technologies on learners. The role of school management in the use of ICTs was then discussed. The chapter then looked into educators and their use of technology in the classroom. Factors facilitating technology use in teaching and learning were discussed. The chapter closed with a discussion on factors impeding teachers from using ICTs in the classroom.

Chapter 4: Research Design and Methodology

This chapter described, discussed and justified the research design and methodology used in the study. Focus was on the description of the research paradigm, the approach, design and data collection techniques to be used to create a deep understanding of management's perceptions of ICT integration in teaching and learning in township and rural schools in KwaZulu-Natal province schools. The issues of credibility and trustworthiness, as well as ethical consideration, were also reflected on so that the results can be accepted as worthy contributions for resolving the research issue and for use by other researchers.

Chapter 5: Data Analysis, Interpretation and Presentation of Findings

Chapter 4 highlighted the significance of the qualitative research design and the use of the case study in particular for this research project. Chapter 5 was made of two sections, namely, data analysis and the discussion of findings. The first section dealt with the analysis of data and the discussion of the empirical findings. The second section dealt with evaluation and a discussion of various documents on ICT integration in teaching and learning. The first aspect of the empirical findings focused on brief profiles of the participating schools. The findings were presented and supported by participants' quotations to answer the research questions outlined in Chapter 1. The interview data were followed by a report stemming from non-participant observation. The last section of the chapter concerned document analysis.

Chapter 6: Synthesis, Summary, Conclusions and Recommendations

Findings were synthesised and the conclusions of the study were provided. Recommendations, based on the literature study and findings were provided. This chapter concludes the study by presenting a summary of the study findings, conclusions, recommendations, limitations, and suggestions for further study.

The first part of the chapter focuses on presenting a summary of the literature review and the empirical study. An amalgamation of the research findings and a discussion of the conclusions of the study as they relate to the research questions follow. An explanation of the recommendations of the study is followed by the ending of the chapter with a review of the limitations of the study, conclusions and suggestions for further study and research.

6.3 SUMMARY OF RESEARCH FINDINGS

The study's findings displayed that principals and departmental heads of the purposely selected secondary schools were in recognition of the significance of ICT integration in teaching and learning. The school management teams acknowledged that technology was the future hence teachers and learners needed to adapt to the demands of the 21st century. The study also revealed some benefits of ICT use within the schools. Among the highlights was the importance of school management's support for teachers and learners.

However, the study revealed several challenges, which impeded the desired ICT integration outcomes. Some of the factors were infrastructural challenges, training and security.

These findings were supported by the literature reviewed in Chapter 3, which helped in answering the research questions. The summary proceeded to highlight the findings of the literature review, the empirical study, non-participant observation and the document review.

6.3.1 SUMMARY OF FINDINGS FROM LITERATURE REVIEW

The literature review began with an overview of teaching and learning in the 21st-century. Differences between traditional and modern ways of teaching and learning were highlighted. The types of knowledge (TPACK, Section 2.2) teachers needed to be ICT competent, in order to implement ICT integration, were discussed (Mishra & Koehler, 2006).

The review continued with a discussion on learning theories and their relevance to ICT integration in teaching and learning. These theories were behaviourism, cognitivism and constructivism (Section 2.4). The discussion highlighted the need for principals and teachers to have an understanding of learning theories in order to achieve their teaching and learning goals. These theories needed to be adapted into an ICT enabled classroom to empower learners to acquire 21st-century skills. Therefore, school management teams had a duty to ensure that this goal is realised.

The literature review continued with a discussion on the theoretical framework underpinning this study. The National Educational Technology Standards for Administrators (NETS-A) 2009 was the theoretical perspective employed in this study and it was covered in detail in chapter 2. NETS-A provided a set of criteria that principals of schools needed to possess, as technology leaders, to manage better technology-enhanced schools. The standards were as follows: visionary leadership, digital age learning culture, excellence in professional practice, systematic improvement, and digital citizenship. These criteria would allow principals to lead ICT integration successfully, hence helping learners acquire 21st-century skills. Therefore, the NETS-A standards compelled every school principal to obtain them as they formed some of the key pillars of the envisaged technologically driven education landscape (DBE, 2004).

The literature review provided information on the theoretical framework, which allowed the researcher to gain insight into the value of the NETS-A standards towards the management of integration in teaching and learning. The information obtained allowed the researcher to answer the main research problem and the first sub-question (see Section 1.6). Having looked at the themes and sub-themes, the researcher concluded that KwaZulu-Natal township and rural secondary school principals and schools still had much to be done before they could integrate ICT in the classrooms. While the principals displayed some of the NETS-A standards, prevailing conditions curtailed their efforts. Some of the main shortcomings such as lack of computers and software, poor internet connection, few subjects being taught with computers, and none to inadequate computer training, made proper ICT integration extremely hard to achieve.

The purpose of the literature study in Chapter 3 was to contextualise the research study using real situations. For this purpose, the researcher studied the ICT education policies of five

countries around the world. These countries were Canada, Finland, Malaysia, Kenya and South Africa. The differences in approach between the developed countries (Canada and Finland) and the developing countries (Malaysia, Kenya and South Africa) provided rich lessons that could help improve the state of technology in education in South Africa. (see Chapter 3, Sections 3.2.1-3.2.6).

The crucial role of school management, led by the principal was highlighted in the literature review. It emerged from the literature that the main roles of the principal were those of formulating the school's vision and that of technology leader. The principal's awareness about technology integration helped him/her foster teacher professional development. This was found to be a critical requirement as it allowed teachers to acquire essential pedagogical skills vital in a technology-enhanced classroom.

The literature further stated that the teacher was a critical factor in the use of technology in the classroom. While learners may already have computer skills, it was the teacher who decided when and how to use technology during a lesson. Therefore, the teacher needed to have insight into the role technology could play during the teaching and learning process (Cubukcuoglu, 2013; Haji, Moluoyonge & Park, 2017).

The cited literature also revealed the perceptions of learners on technology use in teaching and learning. While traditional teaching methods viewed learners as receivers of knowledge, modern ways of teaching considered learners as part of knowledge creation. Learners had become active classroom participants (Motrieux, Vandelinde, Schellens & De Marez, 2015). To achieve fruitful participation, learners needed to have a certain level of computer skills and be digitally literate.

The chapter closed with an examination of the barriers that affected ICT integration. Two types of barriers emerged: extrinsic and intrinsic. Extrinsic barriers consisted of elements such as lack of resources, inadequate technical support, and insufficient training, while intrinsic barriers were made of teachers' beliefs, attitudes and views about knowledge, learning and teaching. The absence of a school's ICT vision also became evident as one of the barriers to the use of ICTs. Lack of a vision resulted in the absence of guidelines that would assist teachers achieve the school curriculum goals.

The literature review was followed by interviews with the selected principals and departmental heads of the schools that participated in the study. A summary of the findings from the interviews follows in the upcoming paragraph.

6.3.2 SUMMARY OF FINDINGS FROM INTERVIEWS

The themes and the sub-themes (see Chapter 5, Section 5.4.1) that emanated from the interviews document principals' and departmental heads' views on ICT integration in the township and rural secondary schools in KwaZulu-Natal. The following are the themes that emerged from the empirical study into perceptions of school management teams about ICT integration in the township and rural secondary schools in KwaZulu-Natal: challenges concerning ICT infrastructure (See Chapter 5, Section 5.4.1.1); ICT training (See Chapter 5, Section 5.4.1.2); security (See Chapter 5, Section 5.4.1.3); non-monitoring of classroom ICT activities by principals (See Chapter 5, Section 5.4.1.4); outdated school rules (See Chapter 5, Section 5.4.1.5); benefits of ICT use (See Chapter 5, Section 5.4.1.6); where we would like to be (See Chapter 5, Section 5.4.1.7); support from school principals (See Chapter 5, Section 5.4.1.8); and replacing textbooks with ICTs (See Chapter 5, Section 5.4.1.9).

6.3.2.1 Challenges concerning ICT infrastructure

The first theme, challenges concerning infrastructure, demonstrated that the selected schools had significant infrastructural shortcomings. The first was the small number of computers available in the laboratories, which made it impossible for a bigger number of learners to use computers at the same time. This practically reduced the number of periods in which learners could access the library. Software was another problem that resulted in fewer subjects being taught using computers. In most of the schools visited, only Mathematics and Life Sciences had the necessary software. What also emerged from this theme was that the shortage of computer hardware could not be mitigated due to the shortage of funds within the schools. Schools wanting to buy computer hardware on their own were constrained by a combination of strict government budgetary controls and apathetic parents. Furthermore, the schools did not have a reliable internet connection. In some schools, connection was only possible when in the computer laboratory. One teacher, subsequently, admitted to preferring to use learners' cell phones for online access, instead of the computer laboratory. Lastly, the theme showed that electricity supply shortages prevented schools from optimally using technology. The country's current power supply problems were even forcing some teachers to revert to outgoing teaching methods, as they were less reliant on electricity than teaching using technology.

6.3.2.2 ICT Training

Principals recognised the need for training in the use of ICTs. They took an active stance towards training by encouraging teachers to attend workshops on ICTs, organised by the department of education. But, there was concern that the training provided was not compulsory. This resulted in a school having teachers with the necessary training, while others did not.

It also emerged that training for learners tended to be neglected probably based on the assumption that today's young people were adept at technology. However, one school had taken the initiative to train learners in the basics of computer use to ensure learners were on a similar level in terms of computer competency.

6.3.2.3 Poor security

The findings revealed that security at schools was a national concern, more so, as it affected the education of learners. Schools with ICTs, in particular, were a target for criminals. This posed a problem, as schools did not have adequate security to protect their assets. Learners were sometimes, attacked by criminals when bringing their cell phones to school for educational purposes. The disturbing part was that fellow learners were responsible for the attacks on other learners by criminals. Lastly, one principal pointed a finger at some teachers for not being upright when it came to computer hardware. Teachers were, at times, responsible for the disappearance of school computers.

6.3.2.4 Lack of clear direction (vision) for use of ICTs

With regard to lack of clear direction for use of ICTs, findings suggested that principals did not monitor the work of teachers using ICTs. Admittedly, the principals had made the effort to bring ICTs to their schools, but they appeared less knowledgeable as to how ICTs were utilised during teaching and learning. By not monitoring ICT classroom activities, the principals were neglecting a major aspect of their duties as technology leaders.

6.3.2.5 Outdated school rules

The theme, outdated school rules, highlighted the fact that some schools still did not allow learners to bring cell phones school. This rule might have been based on previous experiences whereby learners had been irresponsible in their use of cell phones. But, it was clear that, if used responsibly, cell phones could mitigate the shortage of ICTs in the township and rural secondary schools.

6.3.2.6 Benefits of ICT use

On the benefits of ICT use, principals and departmental heads could see some of the changes brought by the use of ICTs. Computers were being used for administrative purposes, which greatly reduces paper use. Learners were showing greater interest in their school-work, which improves school attendance. Some of the schools had noticed an improvement in the Grade 12 examination results, a development they attribute to the availability of ICTs within their schools. This might be the result of the improvement in communication cited between the teachers and the learners. One departmental head noted the accommodating nature of ICTs whereby an introverted learner was able to express himself/herself through ICTs. Teachers were grateful that learners and teachers themselves had been able to acquire computer skills they did not possess before the introduction of ICTs. Lastly, the use of ICTs meant less paper was used by schools, which was environmentally friendly.

6.3.2.7 Funding barrier

The theme, which highlighted what the principals and departmental heads would like to see in their schools showed that they saw the need to increase the number of ICTs they had, but, lack of funds was a barrier. While they could see the benefits, as “no-fee” schools, strict financial restrictions prevented them from increasing the number of available tablets, for example. To counter this problem, one principal suggested that schools buy equipment incrementally, using the resources they had. Principals were keen to see teachers teaching different subjects collaborating on how to improve ICT integration. This would ensure that teaching was streamlined to produce well-rounded outcomes. One departmental head expressed a wish for his school to have a computer-focused stream that would offer learners a comprehensive grounding into computer technology. Another departmental head wanted to see ICT integration being introduced in the lower grades since at the time of the interview, the focus was on Grade 12 learners. This would ensure that learners were familiarised with technology at a younger age. ICT training for SBG members and older teachers was recommended. Another point raised was to see ICTs being available for all the subjects, with dedicated ICT-kitted classrooms for each subject. This would put an end to the existing practice where the teacher had to move with ICTs from one class to the other, risking damaging the equipment in the process.

6.3.2.8 Support from school principals

Departmental heads affirmed that principals were supportive of ICT integration. The principals were seen as the drivers of the integration effort. They ensured that the laboratories were always ready to serve their purpose, which was part of their duties as principals. The principals

continuously encouraged teachers to use ICTs as they were aware of their benefits. Encouragement from the principals tended to have a motivating factor for other teachers to use ICTs.

6.3.2.9 Replacement of textbooks with ICTs

With regard to replacing textbooks with ICTs, findings indicated that some schools had noted that ICTs offered wider possibilities than traditionally thought. Problems encountered with the use of textbooks could be mitigated by the use of e-books. Some of the participants saw e-books as having money-saving advantages for schools as they reduced the need for photocopying learning materials. This also has advantages for the environment as less paper was used.

The shortage of textbooks in schools, coupled with less than ideal control measures existing in schools, needs to be addressed by schools. Based on the researcher's experience, in most cases, textbooks were delivered to the schools. However, issues such as poor handling, mainly by learners, resulted in irreparable damage to the textbooks. Teachers also did not control the return of textbooks at the end of the year. Some learners changed schools without returning the previous year's book loans. This obviously, leads to shortages for the following year's learners. It is the researcher's view that schools need to improve their textbook control measures. Such measures should be accompanied by learner education on the importance of good book-handling. Learners also need to understand that textbooks are not supplied every year but are delivered in four to five-year cycles. Lost textbooks are not replaced, except by the school from its own resources. These would be important measures as migrating to e-books, for example, would likely result in the recurrence of the current challenges.

As part of the study, the researcher also undertook non-participant observation to see the condition of the computer laboratories, and also to observe lessons using ICTs in progress. The next section contains the findings from that exercise.

6.3.3 SUMMARY OF FINDINGS FROM NON-PARTICIPANT OBSERVATION

The computer laboratories were housed in rooms that were spacious and well-maintained. The rooms were adequately ventilated, which created a relaxed atmosphere. In addition to these, the schools were resourced with ICTs in the form of desktop computers, tablets, overhead projectors, television sets and some had whiteboards. Each school had at least one classroom used as a computer lab with a capacity to sit between 40 and 50 learners. Furthermore:

- All four participating schools had some form of internet connectivity.

- The pattern of the lessons observed was more or less similar. The teacher would introduce the day's activity. He/She would then demonstrate on a big screen how the learners were expected to execute their tasks.
- Learners were free to enquire when in difficulty by simply raising their hands.
- There was notable ease of use of the ICTs during lessons. In cases where learners were struggling in opening the relevant pages, teachers were there to offer assistance.
- Learners displayed more enthusiasm during lessons when using ICTs than when they were not.
- There was notable ease of use of the ICTs during lessons. In cases where learners were struggling in opening the relevant pages, teachers were there to offer assistance.
- One of the secondary schools had a computer literacy course which is not part of its curriculum.
- Projectors saved time as most of the information projected on the screen was prepared in advance.
- The principals were not visible to monitor lessons where ICTs were used.
- Departmental heads appeared to have a greater interest in what was taking place in lessons where ICTs were used.

Participant observation indicated that ICT integration was still in its initial stages in KwaZulu-Natal township and rural secondary schools. The equipment came through donations from NGOs and some private sector companies, which had seen the need for schools to start using ICTs as part of their teaching and learning activities, hence the pilot projects.

Two other points worthy of discussion were that the secondary schools participating did not have a vision on the use of ICTs. Furthermore, ICT use lacked collective and collaborative leadership. It was left to the individual teachers who used ICTs to operate as they deemed fit.

The interview data from the principals and departmental heads were testament to the availability of ICTs at the schools. The observation data collected provided the researcher with the evidence that the computer laboratories were being utilised for teaching and learning.

The researcher found the principals enthusiastic about the concept of e-education. They were eager to share their opinions and experiences about the advent of ICTs in their schools. However, they also expressed their frustrations about the slow pace progress as it was delaying what they hoped to achieve.

The collective view of school management teams (principals and departmental heads) in the selected schools appeared positive about the use of ICT in their schools. They want to see their school acquiring the necessary ICTs though they are negatively affected by the

challenges mentioned in the empirical findings. Issues such as the shortage of ICTs were evident during non-participant observation. The computer laboratories could not possibly accommodate the high number of learners that these schools have enrolled. This observation is supported by Section 3.7 of Chapter 3 which states that there is a shortage of computers in rural schools impeding teaching and learning using ICTs.

6.3.4 SUMMARY OF FINDINGS FROM DOCUMENT ANALYSIS

The following is a summary of the findings emerging from the document review:

- The role of school management in the promotion of ICT integration is seen as a critical element as it determines success or failure of integration.
- The KwaZulu-Natal Department of Education (KZNDoE) acknowledges the importance of providing ICT infrastructure at schools to improve teaching and learning. As a result, it has placed focus on rural schools to overcome historical neglect.
- The 2004 White Paper on e-Education is cognisant of the potential of ICTs to assist teaching and learning in preparing learners for the 21st-century.
- While progress has been made to improve the provision of ICT infrastructure in KwaZulu-Natal schools, the provinces' schools are still far behind compared to Gauteng and Western Cape.
- The Department of Basic Education (DBE) is experiences a lack of funds to ensure that its schools are supplied with the necessary ICT infrastructure.
- The White Paper recognises the importance of teaching both teachers and learners basic computer skills to facilitate ICT integration.

Teacher Professional Development is acknowledged as an important element of ICT integration into teaching and learning.

6.4 DISCUSSION OF RESEARCH FINDINGS

In line with the set standard of the International Society for Technology in Education (ISTE), for principals to be effective technology leaders, the National Educational Technology Standards for Administrators (NETS-A) 2009 expects school principals to have the following five criteria: visionary leadership, digital age learning culture, excellence in professional practice, systematic improvement, and digital citizenship. The findings of the interview data, non-participant observation, and document review are analysed and synthesised in the following discussion.

The schools that the researcher visited had serious ICT infrastructure challenges. These included, among others, inadequate computers and tablets, shortage of software, and lack of funds to buy computers. This finding is in line with Nkula and Krauss (2014) who assert that

many township and rural schools in South Africa do not have adequate computers. This shortage of ICTs hampers schools' efforts to integrate ICTs into teaching and learning. It is the government's responsibility to provide adequate learner, teacher support materials (LTSM) to schools (DBE, 2004) an undertaking that is not being fulfilled. This situation places principals in a difficult position as they cannot execute their instruction and technology leadership role fully. The second NETS-SA standard calls on the principal to create a digital learning culture throughout the school while encouraging effective learning through sufficient technological equipment and resources (ISTE, 2009). However, schools do not have enough resources of their own to purchase the required equipment, due to government's strict financial restrictions and other competing demands on school finances. The researcher believes that creative solutions to this dilemma need to be found. Indications are that the government is unlikely to solve this challenge anytime soon. Funds are scarce due to several factors such as the weak economy, lower tax revenue, COVID-19 mitigation efforts, and the recent international credit ratings' downgrades. South Africa is not the only country with a shortage of ICT equipment in its schools. Kenya is another country grappling with a shortage of computers in its schools (see Chapter 3, Section 3.2.4.3.2). However, one possibility could be to follow Canada's example (see Chapter 2, Section 3.2.1), where the government ensures that all schools have basic internet access infrastructure, such as broadband, or today's fibre optic. Parents can support the school by purchasing gadgets such as smartphones, tablets, or laptops for their children. This would reduce the burden on the government and the schools. Indeed, some parents would not be able to afford this. Learners from financially struggling households can use the government supplied ICTs on loan so that they are not left behind. Telecommunications companies also need to be further engaged, as Vodacom is doing in one of the selected secondary schools, as they can play a vital role in terms providing of low-cost data, as high data costs are also an area of concern in some of the schools.

Training in the use of ICTs emerged as one of the themes of the interviews. While principals and departmental heads acknowledge the importance of training in the use of ICTs, there is no evidence that it is formalised and compulsory, despite workshops conducted by the department of education from time to time.

Teacher Professional Development (TPD) is one of the cornerstones of government policy on e-Education (DBE, 2004). Data from the interviews did not suggest that training given to teachers had gone to the level of addressing ICT integration techniques. When training is provided on an ad hoc basis, as it appears to be the case, it is unlikely to yield meaningful results. Training of learners in the use of ICTs tends to be neglected. There usually is a misplaced notion that learners are skilled in the use of ICTs. Only one school, out of the four

visited, provided some form of computer training for learners. The White Paper on e-Education is explicit on this point where it states:

In both primary and secondary schools, the teaching of basic computer principles and word processing skills forms the most important component in the teaching of computer literacy (Government Gazzette No 26762, 2 September 2004).

The above notion is supported by Hattie (2013) who suggests pre-training in the use of computers as a tool for teaching and learning to ensure positive outcomes. This means both teachers and learners need to have technology skills to successfully use ICTs in the classroom. Literature confirms the role of the principal as an instructional and technology leader in the school (Yieng & Daud, 2017). In the data collected, there is no evidence that principals had attended any specific training to upskill them in their role as technology leaders. This is a serious shortcoming as it limits the role of principals as leaders to fulfil their roles. One of the five NETS-A 2009 standards, excellence in professional practice, implores the principal to foster an environment of professional learning and innovation that would empower teachers to promote learning through technological and digital resources. It further states that the principal should be a role model for promoting the use of technology within the school (ISTE 2009). This can happen mainly if the principal is seen using technological devices during his/her lessons.

Inadequate security also came up as a theme of the interviews. Schools with ICTs, are targeted by criminals, wanting to get hold of the computer equipment. This interview data are supported by Dlulane (2019), who reported a break-in at a Soweto primary school, Gauteng Province, where three million rands worth of computer equipment was stolen. Moreover, even learners are not safe from criminals, within and outside the school premises. As one principal attested, some learners have been robbed of their cell phones on their way to and from school and within school premises. Security in schools, according to the White Paper on e-Education, is the government's responsibility (DBE, 2004). Although the White Paper does not specify the exact role of government concerning security, it expects the South African Police Service and parents to play a role in the security of schools. The researcher believes that the lack of clarity on school security matters leaves schools vulnerable to criminal attacks. Lack of security has a negative effect on school ICT integration goals. A school may be reluctant to invest in ICT equipment that is likely to be stolen. The reality is that most township and rural schools do not have enough funds to afford private security due to its unaffordability. This deprives learners an opportunity to learn skills that will be useful to them well into their future.

During the empirical study, it emerged that the principals were not monitoring the work of teachers using ICTs. The interviews with participants did not provide information that suggested that lessons conducted using ICTs were monitored and evaluated. To support this suggestion, findings from non-participant observation reveal that, not even once did the research see any of the principals interviewed moving around during the lessons, to observe what was taking place (see Chapter 5, Section 5.5).

There are two reasons why the principal may not be monitoring these lessons. He may have delegated that task to his deputy or one of the departmental heads or he may have felt inadequately skilled to observe and evaluate such lessons. However, principals, as instructional leaders, have an overall obligation to ensure that lessons take place as prescribed, and syllabi are covered in full. Therefore, they have to pay classroom visits to observe lessons in progress and discuss their perceptions with the teacher post-lesson. This is an opportunity for the principal to engage the teacher based on the observation and offer his/her input to improve the teaching and learning experience. This is supported by Mwawasi (2014) who asserts that among the roles played by management in technological leadership is capacity building. This can be described as the establishment of conditions that would allow individuals within an organisation to engage in the process of learning and adapting to change. Therefore, principals need to possess sufficient ICT skills and knowledge to guide, motivate and lead initiatives for teachers to integrate technology in the classroom (Thannimalai & Raman, 2018; Mihai & Nieuwenhuis, 2015). By having a closer look and maintaining interest in ICT use in the classroom, teachers could be motivated to use and improve their skills in the use of technology. Furthermore, the principal would be promoting and developing a digital learning culture within the school, one of the NETS –A 2009 standard (ISTE, 2009).

During the interviews, the researcher noticed an anomaly between the existing school rules and the direction the schools were taking with regard to ICTs. In the majority of the schools, learners are not allowed to carry cell phones within the school premises. However, special permission was granted, based on teachers' requests, should a lesson require their use. The schools might have had justifiable reasons for maintaining a ban on the carrying of cell phones. However, times are changing, meaning attitudes towards cell phones need to change as well. Some schools, like Mercury High, allow learners to use cell phones in the classroom because of their ease of use (Chapter 5, Section 5.4.1.1.4).

One departmental head preferred using cell phones in the classroom which is supported in literature by a study conducted by Olofsson and Lindburg (2018). The study concluded that responsible use of cell phones could assist learners in their activities (see Chapter 5, Section 5.4.1.5). Learners could use cell phones to diarise dates for assignment deadlines and, as a

calculator. Furthermore, in the researcher's view, today's smartphones can be used to download useful applications such as dictionaries as well as other reference works. The researcher proposes that schools amend this rule as it is, in its current form, outdated. Cell phones are easy to carry, and nowadays, smartphones perform the same functions as tablets. One of the NETS-A 2009 standards, digital citizenship, calls on the principal to ensure that the school community has equal access to digital resources. Moreover, the principal needs to promote, model and establish policies for the safe, ethical, and legally compliant use of technology within the school (ISTE, 2009). Cell phones can reduce the demand for more tablets and laptops within the school to facilitate digital access.

During the interviews, the participants testified seeing many positives brought by the use of ICTs at their schools. Neptune High uses ICTs for administrative purposes. This allowed communication within the school, for example, to be quicker and more efficient. The additional implementation of SA-SAMS in schools made a huge improvement in school administration. A notable benefit of this system was that learners registering for the Grade 12 national senior certificate (NSC) examination no longer need to fill a form manually. The system generates its own form with all the learner information. All that the learner does is to check the correctness of the information and then sign the form if all is in order. The design of the system is meant to reduce the administrative burden on schools, especially on principals. Learners displayed more interest in their school work ever since ICTs were introduced. This is supported in literature by a study conducted in Swedish elementary schools, where the researchers investigated how learners interacted through ICTs during their classroom-learning environment and how ICTs contributed towards their competencies building processes. The researchers found that learners became more concentrated, calm, structured, engaged and amused when working with computers than the traditional way of learning (Sahlin, Tsertsidis & Sirajul Islam, 2017). The other improvement that schools were seeing since the introduction of ICTs is the improvement in the quality of the Grade 12 NSC results. The school's participants attributed this improvement to the use of the technology available within the school.

This justified the call for the full implementation of ICT integration within schools. Schools need to find innovative ways of affording learners the opportunity to learn using technology. Evidence in literature exists of the benefits of ICTs in learning. When schools cite an improvement in Grade 12 examination results, it further justifies efforts to implement ICT integration. On the administrative side, ICTs have many benefits. The principal can collaborate with teachers to collect, analyse, and interpret learner data. This information can then be shared to improve teacher performance and learning. This forms a part of the NETS-A 2009 standards, systemic improvement, where the principal provides digital age leadership and

management to advance the school through productive use of information and technology resources (ISTE, 2009).

When the participants were asked what they wished to see happening in their school with regard to ICTs, many points came out, however, three main ones will be discussed. Firstly, the participants wished to add to the number of tablets and computers they already have. The participants can see the value the ICTs have added to their schools and want to improve on it. But the shortage of funds is a barrier that is limiting what they can achieve. Lack of funds for a project such as ICT in schools is often cited as an impediment. But when viewed in context, it is not an insurmountable barrier. What needs to be accepted is that the government has a constitutional obligation to fund education. This means the government has to ensure that priority is given to meeting the educational needs of the country. If funds are insufficient, they can be sourced from international donors and funding agencies, as the government's response to the COVID-19 pandemic has shown (Joffe, 2020). The private sector needs to play its role as well. In Finland, schools are urged to form partnerships with businesses in facilitating ICT integration (see Chapter 3, Section 3.2.2.8). Therefore, public-private partnerships are the way of the future.

The second point that emerged was more collaboration between teachers to promote ICT integration. Collaboration can start within a school and proceed to involve teachers from other schools. Professional learning communities (PLC) work brilliantly to improve practice as they involve teachers, and subject advisors, among others, sharing of ideas, skills, and overall best practice (DBE, 2015). It is the researcher's view that the formation of PLCs will prove beneficial to the township and rural secondary schools in improving ICT integration since it is still in its nascent stage. They may also serve to encourage and motivate other schools, facing challenges, not to give up.

The third point to emerge was that participants wanted to see ICTs used in all the grades as currently, the focus is on the senior classes such as Grade 12. This would be an important step as it serves to teach learners using ICTs at a younger age. Learners would get to use and learn through ICTs without the pressure associated with matric. However, this point hinges on the acquisition of more computer equipment.

The departmental heads interviewed regarded their principals as pillars due to the support they provided their school to support ICT integration. The principals were seen leading from the front to promote the use of ICT at their schools. Despite the shortages in resources that the schools were experiencing, the principals continued to show a positive attitude towards their respective vision of ICT integrated schools. By ensuring the timeous repair of malfunctioning computer laboratory equipment, the Sun High principal displayed one of the

five NETS-A 2009 standards (see Chapter 5, Section 5.4.1.8), systemic improvement, which places the maintenance of infrastructure as the responsibility of the principal (NETS-A 2009). By ensuring that teachers were using the available ICTs at the school (see Chapter 5, Section 5.4.1.8), the Neptune High principal was demonstrating the first NETS-A 2009 standard, visionary leadership (ISTE, 2009). The standard states that, as a technology leader, the principal needs to have a vision of integrating technology into teaching and learning and go on to share that vision with the teachers. This was in line with Fisher and Waller (2013) whose study indicated that strong technology leadership by campus management was positively correlated to teachers' abilities to integrate technology in the classroom successfully (see Chapter 3, Section 3.5).

Replacing textbooks with ICTs was a theme that also emerged from the empirical study. This would entail the use of electronic facilities such as ebooks, as sources of information, instead of traditional textbooks. Two of the principals felt that ebooks were a resource of the future as they are easier to access.

Township and rural secondary schools faced many debilitating challenges, which resulted in them underperforming. One was the non-return of textbooks at the end of the year by learners and/or damaged and consequently unusable textbooks. The other reason was the shortage of textbooks due to big class sizes. The researcher has personally experienced the shortage of textbooks, not because they had been lost, but because of inadequate delivery by education department contractors. The school would order forty textbooks, for example, but only five would be delivered. This creates a crisis for the subject as proper and timeous teaching is compromised. Schools need to find creative ways of supplementing available resources to fulfil their mandate. Therefore, the idea of using electronic facilities to replace textbooks deserves further investigation.

Based on the literature review, the interview and observation data, the amount of work expected of the principal became obvious. The success of ICT integration was his/her responsibility. The NETS-A 2009 standards spell out clearly what skills the principal needs to possess to successfully lead ICT integration. The principals of the selected schools have indicated commendable qualities, despite trying circumstances, to introduce ICT integration in their schools with little government help. What the researcher also found remarkable was that the interviewed principals and departmental heads were collectively not far behind, in terms of ideas, compared to their counterparts from developed countries. Looking at "Operation culture and leadership at school" from the Finnish education policy document (see Chapter 3, Section 3.2.2.7), among the prescripts are: increase in cooperation between teachers, development of skills among teaching staff and management, compilation of a factual

information package for policy-makers, education providers and school management, which covers opportunities of using ICT and media in education, establishing a peer support system for school management, and the use of the latest technology to manage the school. The development of clear-cut policies would greatly improve their ICT integration goals.

6.5 CONCLUSIONS

The main aim of the study was to enquire how school management teams perceive the integration of ICTs in the township and rural secondary schools in KwaZulu-Natal Province (see Chapter 1, Section 1.7). To achieve this objective, the researcher used a qualitative approach, using interviews, observation, and document review as data collection instruments. The use of multiple instruments was meant for triangulation purposes. The study conclusions will be stated as answers to the three sub-questions.

Sub-question 1: How do principals perceive the integration of information and communication technologies at the school?

The principals of the four purposely selected township and rural secondary schools were positive about the implementation of ICTs in their schools and wish to see this going further. They have expended a lot of effort to realise the goal of teaching using ICTs. The principals can see several improvements in their schools, such as less absenteeism, due to the learners' interest in their school work, more cooperation between teachers and learners, and improvement in the Grade 12 NSC final examination results. Apart from academic improvement, there has been progress on the administrative side, which has made running the schools much easier. The schools are able to use the ICT infrastructure to fulfil their administrative needs, such as internal communication, and the management of learner data. The principals are able to play their roles as instructional and technology leaders within their schools. They have been responsible for ensuring the constant functionality of their schools' computer laboratories and keeping their schools up-to-date with the necessary software. Departmental heads could testify about the involvement of their principals in ensuring that ICT integration in teaching and learning was a success.

However, the positive scenario detailed above is not without challenges. The schools face several challenges, which directly affect ICT integration. One of the main challenges is the inadequate number of computers. The schools have an enrolment of not-less-than eight hundred learners each while having, roughly, sixty tablets in the whole school. This shortage reduces access to many learners. In addition to inadequate software, the schools lack sufficient funds to purchase their own computers. Funds, a government responsibility, as these are "no-fee" schools, have other needs to cater for, and they cannot be easily diverted into purchasing additional computers and software. The schools rely, mainly, on NGOs and the

private sector for assistance. Siyafunda and Vodacom, an NGO and telecommunications company, respectively, have been assisting some of these schools with tablets and internet connectivity. The schools are also affected by an unreliable electricity supply, owing to problems at the national power utility. Power problems affect the use of ICT as they rely on electricity to function.

The principals recognise the need for training in ICTs for teachers if integration is to be a success. While the department of education does organise ICT training workshops, the training seems inadequate. In spite of the challenges listed above, the principals remain positive about the ICT integration journey they are taking and are looking forward to the future.

Sub-question 2: How do departmental heads perceive the integration of information and communication technologies at the school?

The departmental heads were generally convinced that their schools had adopted the right step by embarking on ICT integration in teaching and learning. This was based on the observations they had made ever since their schools started using ICTs. The departmental heads noted that ICTs help to alleviate over-reliance on textbooks, which are in short supply, by providing an alternative resource that learners can use. Learners have been able to search for information for their projects, using the available computer resources. Cell phones are also a useful tool for classroom use, due to their ease of use, though learners are still not allowed to carry them at school, especially within classrooms. Special permission from the school management has to be obtained for learners to bring cell phones to the school.

The principals were commended for the positive roles they played in promoting ICT integration. Their efforts to ensure that computer laboratories were always in working order and seeing to it that teachers were using the ICTs, were applauded by the departmental heads.

Despite the positive sentiments expressed in the above paragraphs, the departmental heads highlighted some of the challenges they experienced with regard to ICT integration. The first one was the small number of tablets and computers that their computer laboratories had. In some cases, teachers had to move from class to class with computer equipment, which was not only unsafe but also time-consuming. Furthermore, due to the limited capacity in the laboratories, waiting for an opportunity to gain access delayed content coverage on the side of the teachers. This resulted in teachers resorting to using cell phones, or unfortunately, resorting to traditional teaching methods. The other drawback was that the tablets were more beneficial to mathematics and science subjects. Other subjects were not well catered for in terms of content. Another shortcoming was that insufficient training had been provided for both

teachers and learners with regard to computers and ICT integration. Although the department of education conducted some workshops, the departmental heads felt that they were not enough.

There were several benefits that the departmental heads mentioned, which they attributed to the introduction of ICTs in their schools. The schools' Grade 12 NSC final matric results have improved considerably. This, combined with the computer skills the learners would have acquired, would place learners in a better competitive position when wanting to pursue post-school opportunities.

Sub-question 3: How can the integration of information and communication technologies at the school be improved?

Principals:

Most of the principals were of the view that schools need to start buying tablets for themselves instead of waiting for government and private donors. This is crucial if integration is to succeed. Closely attached to the buying of tablets, was equipping the schools with a school-wide internet infrastructure. This should also involve negotiating with telecommunications companies for favourable data charges. Currently, internet access is only confined to computer laboratories, which is very limiting. One principal suggested that teachers needed to work as teams to empower one another in the use of ICTs. This should start at the school level and gradually move to involve teachers from other schools. Teachers will need to be computer literate to implement and improve on their practice using ICT integration. Each teacher needs to understand how his/her subject can incorporate technology as this would boost computer use. Schools also need to develop policies related to ICT use in the classroom. These policies should compel teachers to use the laboratory at stipulated intervals. Some principals called for improved security within the schools, as schools with ICTs were a target for criminals.

Departmental heads:

Departmental heads wanted to see an increase in the number of tablets that the schools had. This would result in ICT integration being introduced in the lower grades, as currently, focus is on the higher grades. They wished that all classrooms be ICT enhanced so that there could be widespread use of ICTs by teachers. The current situation where the whole school shares one or two computer laboratories is not efficient. As a result, schools must have premises-wide internet access. This would ensure that WiFi is available throughout the school.

Training for both teachers and learners in the use of ICTs was also recommended. There should also be compulsory use of the laboratory by teachers to promote ICT integration.

Furthermore, training should involve other stakeholders such as school governing body members, as they have a say in how school funds are spent. Schools should have increased security as schools with ICTs were vulnerable to criminal activity.

6.6 RECOMMENDATIONS OF THE STUDY

This section focuses on the researcher's recommendations to the department of education, principals, and departmental heads based on the evidence emanating from the study. These are not prescriptions but evidence-based suggestions designed to provide input for consideration in discussions meant to promote ICT use within schools.

6.6.1 RECOMMENDATIONS TO THE DEPARTMENT OF EDUCATION

Firstly, the KZNDoE needs to accelerate ICT integration training programmes for school principals and their SMTs. Findings reveal that, while some workshops are held from time to time, the researcher believes that these are not adequate.

Secondly, the study reveals that the KZNDoE has not been able to fulfil its goal of furnishing schools with the necessary ICT infrastructure for integration in the township and rural secondary schools. This is placing learners attending these schools at a huge disadvantage. The current outbreak of the COVID-19 pandemic has brought into sharp focus the extent of disparities that exist between the economically rich and the poor in South Africa. Previously advantaged government and private schools have been able to use online platforms such as Skype, Zoom, Microsoft Teams, and Google for Education among others, to continue with teaching through e-learning during the countrywide lockdown (Venter, 2020). However, the previously disadvantaged sector of the schooling system, where the majority of township and rural schools fall, with hardly any means of accessing the above-mentioned platforms, are being left behind.

The researcher recommends that the KZNDoE make it a priority to explore the use of e-learning. At the time of writing, it is not clear when the current lockdown may end and the longer it continues, the more disadvantaged township and rural secondary school learners will be. While it would probably be out-of-reach to supply every learner with a tablet or laptop at this stage, the department of education needs to engage parents, civil society, computer hardware and software companies, and telecommunications providers to find solutions to this enormous challenge. The Fourth Industrial Revolution is imminent and cannot be held back. Learners from the township and rural schools should not be excluded from it. Therefore, engaging the above-mentioned stakeholders would hopefully provide long-lasting solutions to the shortage of ICTs within the schools.

6.6.2 RECOMMENDATIONS FOR SCHOOL PRINCIPALS

Principals are instructional and technology leaders at their schools. Firstly, they need to understand the concept of ICT integration to be able to provide leadership. Furthermore, they need to acquire or develop their technology skills, as they are role models at their schools. When principals pay classroom visits, they have to be able to provide valuable input into the teachers' ICT integrated lessons, as they understand the concept.

Secondly, evidence from the study suggests that ICT integration is a costly exercise requiring considerable financial resources. This calls on principals to have an open mind concerning redirecting more expenditure of the school budget towards ICT integration. As one of the interviewed principals suggested, schools have the power to decide on what they can spend money on. Therefore, before looking for external assistance, the researcher would recommend that schools first look at the available resources.

Thirdly, principals need to review school rules as some of them are contrary to the demands of the 21st-century. The banning of the carrying of cell phones at school by learners needs to be revisited. While the concerns raised by some of the principals about cell phones cannot be dismissed, it is paramount to find solutions, which can satisfy both parties. As one secondary school departmental head indicated, a smartphone can be used as a learning tool in the absence of tablets and computers.

On a broader level, the impact of COVID-19 has effectively disrupted the world order as it was known. Uncertainty has crept into every sector of society, including education. Therefore, school management teams in the township and rural secondary schools will have to stay ahead of the unfolding situation by devising strategies and organising means to mitigate the effects of the unknown world being anticipated, going forward. During the lockdown due to COVID-19, some teachers were able to communicate with their learners through WhatsApp to offer some form of tuition. So, learners need to be educated about responsible cell phone use. This would mitigate against future pandemics and/or natural disasters, which may prevent learners from physically attending school.

6.6.3 RECOMMENDATIONS FOR DEPARTMENTAL HEADS

Departmental heads are curriculum managers. Among their duties is to ensure that teachers manage to cover the scope of the curriculum as prescribed by the department of education. With the advent of ICT integration, departmental heads should be at its forefront. They need to update their computer skills and be able to master the available technology at their schools. This would enable them to monitor and guide ICT integration. Furthermore, teachers would be motivated to use technology in their lessons when they see their immediate managers doing the same.

6.7 SUGGESTIONS FOR FURTHER RESEARCH

The main thrust of the study was school management perceptions of ICT integration in teaching and learning in the township and rural secondary schools. Looking at issues that arise out of the study, the researcher would recommend that future studies be more focused on principals as instructional and technology leaders and their role in ICT integration.

The researcher would like to see more research studies on secondary school principals' technology leadership attitudes and behaviours as they relate to disadvantaged communities. This would, hopefully, provide insight into how to deal with conditions that affect the majority of citizens in South Africa.

6.8 LIMITATIONS OF THE RESEARCH STUDY

While the study produced the results that the researcher had hoped for with regard to the research paradigm, design, conceptual framework and the objectives, some limitations and challenges could not be avoided. Similar to other case studies, the interpretation of this study's findings is limited in some ways. Firstly, the researcher used his discretion in selecting the schools, principals, and departmental heads participating in this study. This was based on the belief that the selected participants would provide the necessary insights into the study.

Secondly, while data drawn from the participants supplied valuable insight into school management teams' perceptions of ICT integration in the township and rural secondary schools in KwaZulu-Natal Province, it must be accepted that these experiences were from only the four purposely selected schools, as a result, the findings from this study cannot be generalised to other township and rural secondary schools. Thirdly, the sample consisted of four secondary schools, four principals, and four departmental heads, and cannot be regarded as representative of the perceptions of all KwaZulu-Natal school management teams.

Despite the limitations stated above, the researcher is hopeful that this study will assist in providing insight into what principals and their management teams experience in schools in implementing ICT integration. The study will also accelerate the provision of ICTs in schools as they are in short supply. To illustrate this point, when the researcher approached the district office for a list of the township and rural schools with computer laboratories, less than fifteen percent of schools had laboratories. Moreover, in some of those schools, the laboratories were not being used for teaching and learning.

There also needs to be a training programme for ICT leadership for principals. This would ensure that they understand their role as, not only instructional but also technology leaders. The training will strengthen their capacity to lead the ICT revolution towards preparing learners for the knowledge economy of the twenty-first century.

6.9 CONCLUSION

The study wanted to investigate the perceptions of school management teams towards ICT integration in the township and rural secondary schools. The introduction of technology into technology, to prepare learners for the Fourth Industrial Revolution (4IR), has demanded that learners learn through ICTs to develop competences thought necessary to thrive in the 21st-century. The study indicates that some schools have taken steps to meet this challenge. These 21st-century demands have placed school management teams, more especially principals as instructional leaders, in a demanding position of leading the implementation and sustenance of ICT integration in schools. The National Educational Standards for Administrators-2009 sets standards that principals have to meet to lead technology-aided schools. The reviewed literature indicates the role played by the principal in leading ICT integration. However, existing factors at the schools, which emerged through the empirical study, indicated that ICT integration is still far from being at a satisfactory level. To improve the phenomenon under investigation, the researcher made recommendations, based on the findings, to the relevant parties, to improve the management of ICT integration in the township and rural secondary schools.

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APPENDICES

APPENDIX A

PARTICIPANT INFORMATION SHEET

Date:

Title: **Perceptions of school management teams on information and communication technology integration in township and rural secondary schools in KwaZulu-Natal.**

DEAR PROSPECTIVE PARTICIPANT

My name is Michael Togara Tigere. I am doing research under the supervision of Professor T Netshitangani, in the Department of Education Management and Leadership towards a PhD degree at the University of South Africa. We are inviting you to participate in a study entitled, **Perceptions of school management teams on information and communication technology integration in township and rural schools in KwaZulu-Natal.**

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could make a contribution towards understanding how you school deals with ICT integration.

WHY AM I BEING INVITED TO PARTICIPATE?

You are invited because your school has computer and ICT related equipment for teaching and learning.

I obtained your contact details from KwaZulu-Natal Department of Basic Education head office. Your school is one of four schools that have been purposively selected due to their use of ICT in teaching and learning.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study involves you taking part in a semi-structured interview to shed light on the researcher's questions. The interview will be approximately 45 minutes long.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent……../ assent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

There are no anticipated benefits for taking part. However, the information that you give will possibly lead to informed and better use of technology in the classroom.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

Apart from the loss of the participants' time, there are no foreseeable risks associated with the study.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher, will know about your involvement in this research. Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

However, be aware that your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. Should any of the preceding possibilities occur, your name and that of your school will not be published.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

The researcher will store hard copies of your answers for a period of five years in a locked filing cabinet for future research or academic purposes; electronic information will be stored on a password-protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

Should it become necessary to destroy the information, hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer using relevant software programs.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

The participants will not receive any payment or incentives for taking part in the study.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received written approval from the Research Ethics Review Committee, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact me on 0827232370 or email tigerem27@outlook.com.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact Michael Togara Tigere.

Should you have concerns about the way in which the research has been conducted, you may contact the research ethics chairperson of the College of Education, Dr Madaleen Claassens, email:mcdt@netactive.co.za

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

_____

Signature

Michael Togara Tigere

APPENDIX B

ASSENT TO PARTICIPATE IN THIS STUDY (Return slip)

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the _____.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print) _____

_____ _____

Participant Signature Date

Researcher's Name & Surname (please print) _____

_____ _____

Researcher's signature Date

APPENDIX C

Questions to principals

1. How are ICTs used by your teachers during the teaching and learning process?

2. As the principal, what form of support do you give to teachers and learners to promote ICT integration?

3. What challenges do you encounter with regard to the use of ICTs at the school?

4. What are the benefits of the use of ICT at the school?

5. What recommendations can you make to ensure that ICT integration is a success at the school?

Questions to departmental heads

1. How are ICTs used in the teaching and learning process?

2. How does the use of ICTs affect interaction during the teaching and learning process?

3. Are you receiving any support from the principal with regard to the use of ICTs?

4. What problems do you encounter as a departmental head with regard to the use of ICTs?

5. What are the benefits of the use of ICTs?

6. What recommendations can you make to ensure that ICT integration takes place successfully at the school?

APPENDIX D

OBSERVATION SCHEDULE

Title of thesis: Perceptions of school management teams on information and communication technology integration in township and rural secondary schools in KwaZulu-Natal

Name of school……..

Date of observation: ……

OBSERVATION	**DESCRIPTION**
1. Who is in the scene? 1.1 Teacher 1.2 Learners 1.3 Manager (in case	 Gender • How many learners present? • Their gender, age range • What is the gender of the principal? • Is the school principal moving around the school premises observing teaching and learning activities? • Which lessons does the principal go to when observing teachers? Does the school principal visit all classes including the computer laboratory?
2. What is happening here? 2.1 What ICT tool is being used?	What is the subject being taught? • Computer • Electronic white board • Tablet • Smartphone • Content knowledge • Tool operation knowledge

2.2 Does the teacher show competence 2.3 How are the learners and the educators interacting with one another?	• enthusiasm • interest • Who talks and who listens? • Who operates the tool?
3. Where is the teaching taking place?	• In the laboratory or classroom? • What physical setting forms their context? • What natural resources and technologies are created or used?
4. Subtle factors	Are there any informal and unplanned activities during the lesson?

APPENDIX E

DOCUMENT REVIEW GUIDE

1. Name of the school……

2. The kind of document being reviewed…….

3. Date document received……

4. Date document reviewed……..

5. The following are the questions the student will be seeking answers to:

   Is there mention of the school's vision for the integration of ICT in teaching and learning?

   Is there mention of ICT in terms of the size of the room(s), equipment, and allocation of space?

   Is there mention of training for school management in the use of ICT?

   Is there information in the document suggesting that management has sufficient skills to guide and lead initiatives for teachers to integrate technology in the classroom?

   Is there mention of pre-training for learners in the use of ICT?

   Is there mention of capacity building as a management leadership role?

   Is there mention of peer learning?

   Does the document mention internet access being available at the school?

   ……
   ……

6. Summary of the overall importance of ICT integration in terms of improving teaching and learning outcomes at the school……
   ……
   ……

APPENDIX F

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma | Tel: 033 392 1063 | Ref.:2/4/8/1849

Mr MT Tigere
PO Box 424
Hilcrest
3650

Dear Mr Tigere

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"PERCEPTIONS OF SCHOOL MANAGEMENT TEAMS ON INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN TOWNSHIP AND RURAL SECONDARY SCHOOLS IN KWAZULU-NATAL"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 24 July 2019 to 10 January 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Pinetown District

Dr. EV Nzama
Head of Department: Education
Date: 24 July 2019

APPENDIX G

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2019/06/12

Ref: **2019/06/12/30654084/42/MC**
Name: Mr MT Tigere
Student: 30654084

Dear Mr Tigere

Decision: Ethics Approval from 2019/06/12 to 2024/06/12

Researcher(s): Name: Mr MT Tigere
E-mail address: 30654084@mylife.unisa.ac.za
Telephone: +27 82 723 2370

Supervisor(s): Name: Prof T Netshitangani
E-mail address: Netsht1@unisa.ac.za
Telephone: +27 12 429 4261

Title of research:

Perceptions of school management teams on information and communication technology (ICT) integration in township and rural secondary schools in KwaZulu-Natal

Qualification: PhD in Educational Leadership and Management

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2019/06/12 to 2024/06/12.

*The **low risk** application was reviewed by the Ethics Review Committee on 2019/06/12 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2024/06/12.** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2019/06/12/30654084/42/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof PM Sebate
ACTING EXECUTIVE DEAN
Sebatpm@unisa.ac.za

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX H

Application for Permission to Conduct Research in KwaZulu Natal Department of Education Institutions

1. Applicants Details

Title: Prof / Dr / Rev / Mr X/ Mrs / Miss / Ms Surname: ___Tigere_____

Name(s) Of Applicant(s): ___Michael Togara_____ Email: __tigerem27@outlook.com_____

Tel No: _031 765 8930_____ Fax: _____-_____ Cell: __082 723 2370_____

Postal Address: _PO Box 424 Hillcrest 3650_____

_____

2. **Proposed Research Title: __Perceptions of school management teams on information and communication technology integration in township and rural secondary schools in KwaZulu-Natal_____**

3. Have you applied for permission to conduct this research or any other research within the KZNDoE institutions?

Yes	NoX

If “yes”, please state reference Number: _____N/A_____

4. Is the proposed research part of a tertiary qualification?	YesX	No

If “yes”

Name of tertiary institution: _____UNISA_____

Faculty and or School: __College of Education_____

Qualification:_____PhD-Education_____

Name of Supervisor: _Prof T Netshitangani_____ Supervisors Signature_____

If “no”, state purpose of research: __N/A_____

_____

5. **Briefly state the Research Background: _The use of technology in classrooms has become imperative in today’s schooling environment. Throughout the world, governments, education systems, researchers, and parents consider technology to be an essential part of a child’s education. In South Africa, the Department of Education released a White Paper on e-education in 2004, which outlined the government’s response to the then new information and communication technology (ICT) environment in education. Among the plans was to ensure that all schools have access to a wide choice of diverse, high quality communications service for the benefit of all learners and local communities. The purpose of the study is to investigate how school management teams perceive the integration of ICT in teaching and learning in their schools.**

6. **What is the main research question(s): _How do school management teams perceive the integration of information and communication technology in township and rural secondary schools in KwaZulu-Natal?**

7. **Methodology including sampling procedures and the people to be included in the sample: _____Interviews will be conducted with school principals and departmental heads in four purposively selected secondary schools.**

8. **What contribution will the proposed study make to the education, health, safety, welfare of the learners and to the education system as a whole?: __The proposed study will hopefully shed light on the extent and impact of ICT use in the selected schools. Policy makers may also benefit through the findings in order to make informed decisions with regard to the use of ICT in schools.**

KZN Department of Education Schools or Institutions from which sample will be drawn – If the list is long please attach at the end of the form		
Sun High School		
Neptune Secondary School		
Saturn Secondary School		
Mercury High School		

9. **Research data collection instruments**: *(Note: a list and only a brief description is required here - the actual instruments must be attached)*: **__1. Interviews with principals and departmental heads. 2. Document review. 3. Nom-participant observation.**

10. **Procedure for obtaining consent of participants and where appropriate parents or guardians:**

__The researcher will personally, and in writing, approach the selected participants to take part in the study._____

_____

_____

_____

_____

_____

11. **Procedure to maintain confidentiality (if applicable): _The researcher will assure all participants that all information they provide is confidential and that their identities and those of their schools shall remain a secret.**

12. **Questions or issues with the potential to be intrusive, upsetting or incriminating to participants (if applicable): _____N/A_____**

_____

_____

_____

13. Additional support available to participants in the event of disturbance resulting from intrusive questions or issues (if applicable): _Participants will be informed that they have a right to refuse to answer any questions they may be uncomfortable with and that that right will be respected by the researcher._____

_____

_____

_____

_____

_____

_____

14. Research Timelines 15 June 2019 : _31__August 2019_____

_____

_____

_____

15. Declaration

I hereby agree to comply with the relevant ethical conduct to ensure that participants' privacy and the confidentiality of records and other critical information.

I __Michael Togara Tigere__declare that the above information is true and correct

_____ **_____**

Signature of Applicant **Date: 23/07/2019**

16. Agreement to provide and to grant the KwaZulu Natal Department of Education the right to publish a summary of the report.

I/We agree to provide the KwaZulu Natal Department of Education with a copy of any report or dissertation written on the basis of information gained through the research activities described in this application.

I/We grant the KwaZulu Natal Department of Education the right to publish an edited summary of this report or dissertation using the print or electronic media.

_____ **_____**

Signature of Applicant(s) **Date: 23/07/2019**

Return a completed form to:

Phindile Duma – Tel: 033 392 1063

Office of the HOD; KwaZulu Natal Department of Education

Hand Delivered:

Office 318; 247 Burger Street; Anton Lembede House; Pietermaritzburg; 3201

Or

Ordinary Mail

Private Bag X9137; Pietermaritzburg; 3200

Or

Email

Phindile.Duma@kzndoe.gov.za

Or

Fax

033 392 1203

APPENDIX I

EDITORIAL

CERTIFICATE

Author: Michael Togara Tigere

Document title: Perceptions of school management teams on information and communication technology integration in township and rural secondary schools in KwaZulu-Natal

Date issued: 07/06/2020

SUPREME EDITOR

This document certifies that the above manuscript was proofread and edited by Dr Gift Mheta (PhD, Linguistics).

The document was edited for proper English language, grammar, punctuation, spelling and overall style. The editor endeavoured to ensure that the author's intended meaning was not altered during the review. All amendments were tracked with the Microsoft Word "Track Changes" feature. Therefore, the authors had the option to reject or accept each change individually.

Kind regards

Dr Gift Mheta (Cell: 073 954 8913)

SUPREME EDITOR